RANDOMISED CONTROLLED STUDY OF COMPARISON OF TWO APPROACHES OF INFRACLAVICULAR BRACHIAL PLEXUS BLOCK USING NERVE STIMULATOR FOR UPPER LIMB SURGERIES

Dissertation submitted
in partial fulfilment of the requirements
for award of the degree

M.D. (Anaesthesiology)

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APRIL 2016

CERTIFICATE

This is to certify that this dissertation entitled **"RANDOMISED CONTROLLED STUDY OF COMPARISON OF TWO APPROACHES OF INFRACLAVICULAR BRACHIAL PLEXUS BLOCK USING NERVE STIMULATOR FOR UPPER LIMB SURGERIES"** submitted by **Dr.GEETHANJALI.R** in partial fulfillment for the award of the degree Doctor of Medicine in Anaesthesiology by The Tamilnadu Dr.M.G.R. Medical University, Chennai is a bonafide work done by her at GOVERNMENT KILPAUK MEDICAL COLLEGE, CHENNAI, during the academic year 2013-2016.

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DECLARATION BY THE GUIDE

This is to certify that this dissertation entitled **"RANDOMISED CONTROLLED STUDY OF COMPARISON OF TWO APPROACHES OF INFRACLAVICULAR BRACHIAL PLEXUS BLOCK USING NERVE STIMULATOR FOR UPPER LIMB SURGERIES"** submitted by **Dr.GEETHANJALI.R** in partial fulfillment for the award of the degree Doctor of Medicine in Anaesthesiology by The Tamilnadu Dr.M.G.R. Medical University, Chennai is a bonafide work done by her at GOVERNMENT KILPAUK MEDICAL COLLEGE, CHENNAI, during the academic year 2013-2016, under my guidance and supervision.

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DECLARATION

I, **Dr. GEETHANJALI.R**, solemnly declare that this dissertation, entitled "**RANDOMISED CONTROLLED STUDY OF COMPARISON OF TWO APPROACHES OF INFRACLAVICULAR BRACHIAL PLEXUS BLOCK USING NERVE STIMULATOR FOR UPPER LIMB SURGERIES"**, has been prepared by me, under the expert guidance and supervision of **Prof.Dr.T.Murugan,MD.,DA.,** Professor and HOD, Department of Anaesthesiology, Government Kilpauk Medical College Hospital, Chennai and submitted in partial fulfilment of the regulations for the award of the degree M.D.(Anaesthesiology) by The Tamil Nadu Dr. M.G.R. Medical University and the examination to be held in April 2016. This study was conducted at Government Kilpauk Medical College Hospital and Government Royapettah Hospital, Chennai. I have not submitted this dissertation previously to any university for the award of any degree or diploma.

Place: Chennai **(Dr.GEETHANJALI.R)**

Date:

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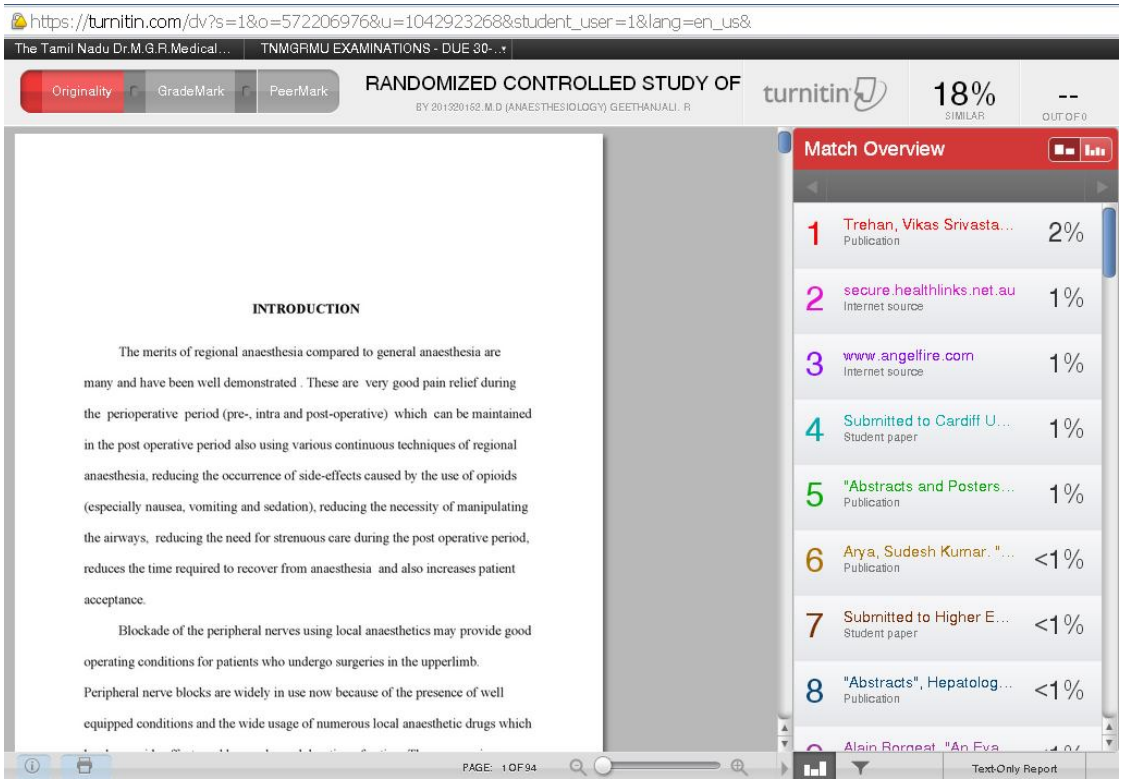
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INTRODUCTION
The merits of regional anaesthesia compared to general anaesthesia are many and have been well demonstrated . These are very good pain relief during the perioperative period (pre-, intra and post-operative) which can be maintained in the post operative period also using various continuous techniques of regional anaesthesia, reducing the occurrence of side-effects caused by the use of opioids (especially nausea, vomiting and sedation), reducing the necessity of manipulating the airways, reducing the need for strenuous care during the post operative period, reduces the time required to recover from anaesthesia and also increases patient acceptance.
Blockade of the peripheral nerves using local anaesthetics may provide good operating conditions for patients who undergo surgeries in the upperlimb. Peripheral nerve blocks are widely in use now because of the presence of well equipped conditions and the wide usage of numerous local anaesthetic drugs which
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INTRODUCTION

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ANNEXURES

S.NO.	TITLE
1.	INSTITUTIONAL ETHICAL COMMITTEE APPROVAL
2.	PROFORMA
3.	PATIENT CONSENT FORM
4.	MASTER CHART

ABSTRACT

Background: The brachial plexus in infraclavicular region can be blocked by various approaches. Aim of this study was to compare two approaches (coracoid and clavicular) regarding success rate, discomfort during performance of block, tourniquet tolerance and complications.

Methods: This randomised, controlled, prospective study included sixty adult patients of both sexes of ASA status 1and 2 randomly assigned to receive nerve stimulator guided infraclavicular brachial plexus block either by lateral coracoid approach (group A, n = 30) or medial clavicular approach (group B, n = 30) with 25–30 ml of 0.5% bupivacaine. Sensory block in the distribution of five main nerves distal to elbow, motor block (Grade 1–4), discomfort during performance of block and tourniquet pain were recorded.

Results: The depth of insertion was less with corocoid approach group when compared to clavicular approach group. Time taken to perform block was shorter in corocoid approach group when compared to clavicular approach group.Onset of both sensory and motor blockade were similar in both the groups.Successful block was achieved more with corocoid approach group than with the clavicular approach group. Tourniquet tolerance was found to be better with corocoid

approach group than with the clavicular approach group. Complications like vascular puncture was similar in both the study groups.

Conclusion: Infraclavicular brachial plexus block using corocoid approach provides an adequate sensory and motor blockade, easy to perform with high success rate, good tourniquet tolerance and less complications when compared to that using clavicular approach.

Keywords: Coracoid approach, infraclavicular brachial plexus block, mid-clavicular approach

INTRODUCTION

The merits of regional anaesthesia compared to general anaesthesia are many and have been well demonstrated . These are very good pain relief during the perioperative period (pre-, intra and post-operative) which can be maintained in the post operative period also using various continuous techniques of regional anaesthesia[1-5], reducing the occurrence of side-effects caused by the use of opioids[1,2] (especially nausea, vomiting and sedation), reducing the necessity of manipulating the airways, reducing the need for strenuous care during the post operative period, reduces the time required to recover from anaesthesia and also increases patient acceptance.

Blockade of the peripheral nerves using local anaesthetics may provide good operating conditions for patients who undergo surgeries in the upper limb. Peripheral nerve blocks are widely in use now because of the presence of well equipped conditions and the wide usage of numerous local anaesthetic drugs which has lesser side effects and has prolonged duration of action. There are various approaches for blocking the brachial plexus:

a) Interscalene approach
b) Supra clavicular approach
c) Infra clavicular approach
d) Axillary approach

Block of the brachial plexus[6] using supraclavicular approach when compared to the infraclavicular approach seems to usually produces dense sensory, motor blockade providing very good operating conditions but with the disadvantage of more chances of causing pneumothorax. The infraclavicular approach of block of brachial plexus has its own merits like decreased incidence of discomfort during the procedure especially during patient positioning and also reduction in the chances of occurrence of pneumothorax. In comparison with the block of brachial plexus using axillary approach, very good tolerance of arm tourniquet with better patient comfort and success rate in the block of musculocutaneous nerve seems to be higher in infraclavicular approach.

Techniques of regional anaesthesia targets to find out a nerve or plexus of nerves and deposits local anaesthetic drug surrounding the nerve or the nerve plexus, thereby producing block in the conduction along the nerve fibre. Numerous techniques are followed to produce blockade of nerve fibres. The various modalities widely in practice to identify a nerve or nerve fibres to facilitate the block are elicitation of paresthesia, stimulation of peripheral nerves and ultrasound which is gaining importance in the recent years.

Nerve blocks were carried out by using anatomical landmarks to facilitate the insertion of the needle and also by elicitation of paraesthesia.

(as soon as the needle used to locate the nerve comes in contact with the nerve, the patient might feel a ‘pins and needles’ sensation or like ‘electric shock). The demerits of elicitation of paresthesia technique were probability of rise in the chances of injury to the nerve when the needle comes in contact with the nerve that may be assessed from the elicitation of paraesthesia. Moreover, eliciting paraesthesia may cause discomfort to the patient and may not be tolerated by certain patients.

Stimulators used in peripheral nerve stimulation are provided with an objective aspect which facilitates the identification of a nerve. These stimulators produce a little fraction of direct current (DC) at the needle, when it approaches the nerve, transmission of the current to the nerve will occur. This is then followed by stimulation of the nerve which may then produce a motor response. By getting motor response of the required nerve needed to be blocked, chances of obtaining successful blockade remain high.

This study is proposed to compare the two different approaches used for block of the brachial plexus using infraclavicular approach by the use of nerve stimulator in upper limb surgeries.

AIMS AND OBJECTIVES

The aim of the study is to compare two approaches of infraclavicular brachial plexus block- coracoid and clavicular approaches for upperlimb surgeries using nerve stimulator.

PRIMARY OBJECTIVE:

- To evaluate the success rate of the nerve block.

SECONDARY OBJECTIVE:

- Discomfort during performance of block.
- Complications.
- Pain related to tourniquet and tolerance.

PERIPHERAL NERVE STIMULATORS (PNS)

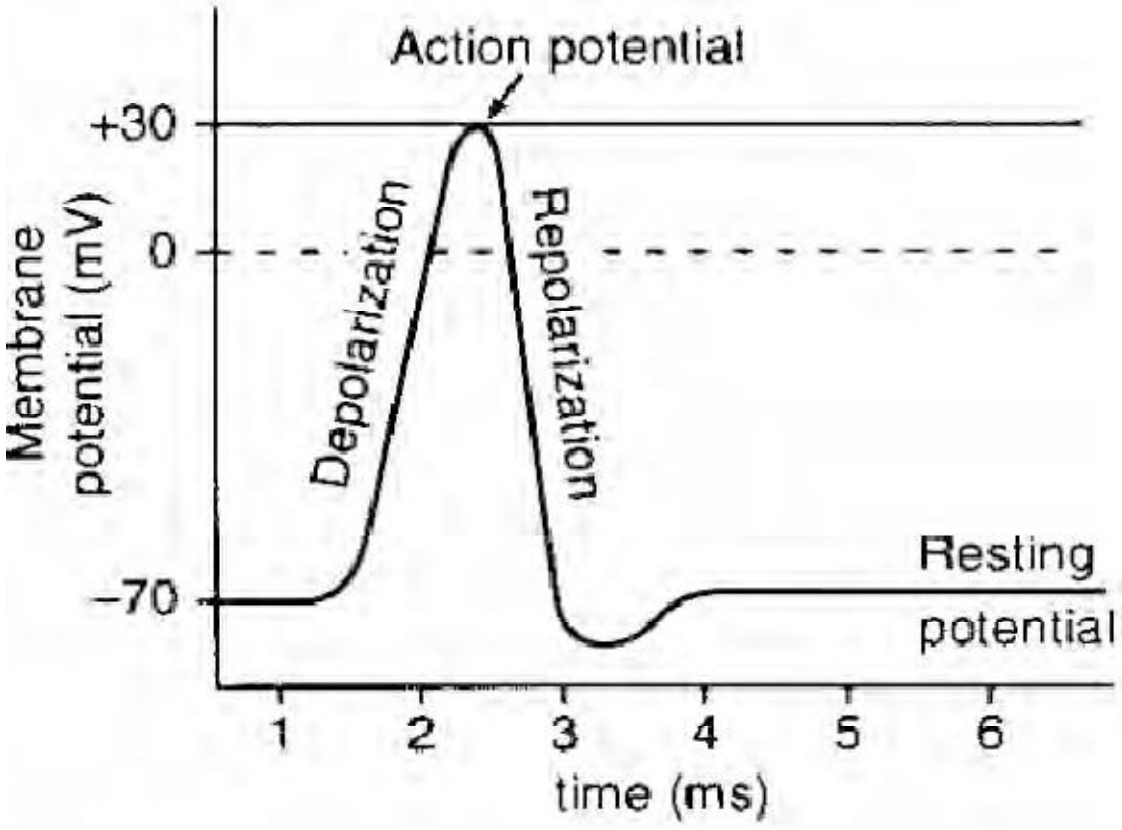
History

The practice of peripheral nerve stimulation to perform nerve blocks has been seen since the last century. In 1928, Kulenkampff explained regarding block of brachial plexus and Perthes was given the credit for identification of the nerves by the use of electrical stimulation. Because of the lack of gentleness in the technique and also the heaviness of the equipment, it became obsolete.

In the year1955, Pearson demonstrated the location of motor nerves with the use of electrical stimulation carried out by using a needle which was insulated. In 1962, Greenblatt and Denson invented a nerve stimulator which was easy to carry and transistor like which acted as an initiative for the newer generation nerve stimulators now being used in regional anaesthesia. The instrument seemed to be costly and not easy to obtain. At last in 1969, Wright explained about a Block- Aid monitor for carrying out nerve blocks that made the technique very much popular, affordable and also easy to use.

Previously, needles which were non-insulated had been in use for stimulating the nerves while performing the nerve blocks, nowadays needles which were insulated were in widespread use. Nerve stimulation using percutaneous technique seemed to be a newer method used for

identification of the nerve non invasively. Urmey elaborated the advantage of cutaneous electrode probe which is covered with an electrical sheath (Percutaneous electrode guidance-PEG) to map out anatomical course of the nerve and further guidance of the needle to advance closer to the nerve.



Nerve Action Potential

Classification of Sensory Fibers

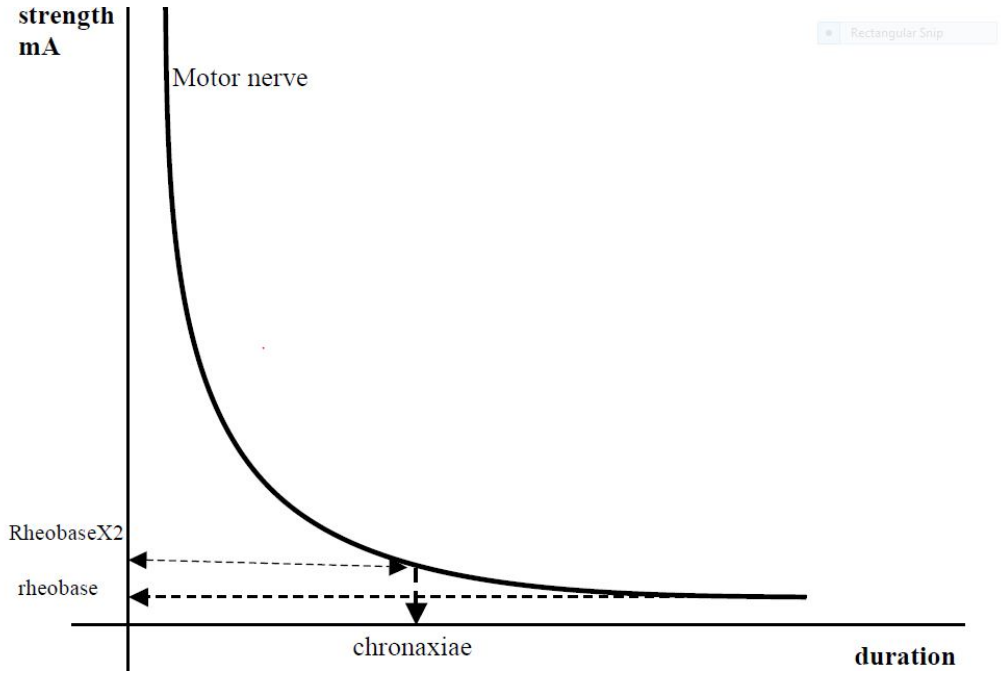
Sensory receptors	Speed of transmission	Sensory function	Myelination
C Fibres	0.5 -2m/sec	Noxious chemical, Mechanical, thermal activation (Slow burning second pain)	Unmyelinated
A-Alpha fibres	70 -120m/sec	Noxious chemical thermal, mechanical stimuli, (sharp fast, first pain)	Lightly myelinated
A-Beta fibres	30 -70m/sec	Non painful, light,touch, pressure, vibration proprioception	Heavily myelinated
A-Gamma fibres	30-70m/sec	Proprioception/Motor to muscle spindle	Myelinated
A-Delta fibres	12-30 m/sec	Pain, cold, touch	Myelinated
B fibres	3 -15 m/sec	Pre ganglionic autonomic (sympathetic)	Myelinated

In neurons which are present in the resting state, the electrical potential of the interior of the cell seems to have an electric potential which is negative when compared to the outside which is referred to as the resting membrane potential of the cell and is around -70mV. If a nerve fibre gets “stimulated”, an alteration in the ionic permeability of the cellular membrane (rise in the sodium channel conductance) takes place. A stimulus which is strong enough may produce depolarization the cell membrane adequately to start an action potential which proceeds along the neural membrane to cause stimulation of the muscle and may produce contraction of the muscle. Figure shows action potential. When the stimulus applied is not adequate, action potential would not be created even if it is given for a longer period. Conversely, an adequate stimulus given for only a shorter period of time would not lead to an action potential. The stimulus must be adequate and should be applied for sufficient period to create an action potential.

Current

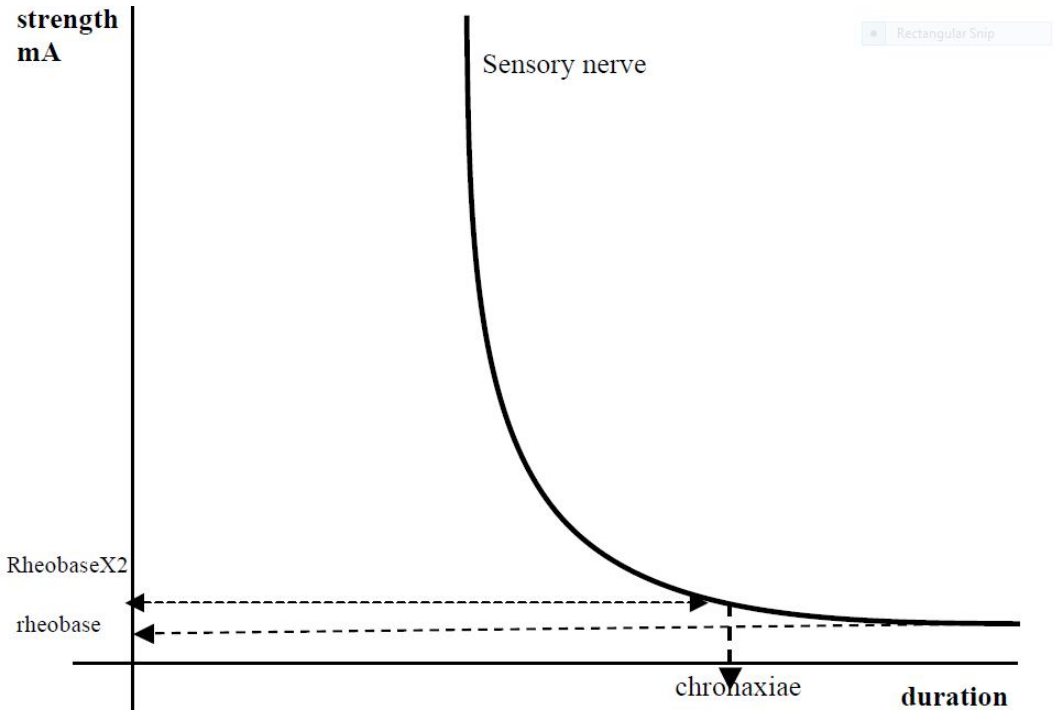
The smallest quantity of current which is necessary to start a nerve action potential is known as the **Rheobase**. Under this particular level, the current could not be able to start an electrical impulse though it is given for a longer period of time.

Chronaxie is the time duration the current need to be given to the nerve fibre so as to start an electrical impulse if the level of the current is **two times the rheobase**. It is said to explain the excitability of various tissues.



Strength-duration curve of a motor nerve.

When the current is same as that of rheobase, the current should be given for a longer duration. A current two times that of rheobase value has to be given for a limited time in order to get a response.



Strength-duration curve of a sensory nerve

The chronaxie depends on sensitivities and refractory periods of nerves and is different for different nerves. In nerves which conduct faster such as the Aα motor nerve fibres , chronaxie seems to be small because the periodin which the nerve is refractory is smaller when compared to the sensory nerves which conduct slowly such as Aδ or the C (non myelinated) nerve fibres which are sensory.

Motor nerves when compared to sensory nerves have a shorter chronaxie. Therefore, making use of a current with shorter chronaxie, we can stimulate a nerve which is motor whereas the nerve which is sensory

may not be stimulated using the same current. This infers that a painless motor response may be obtained. Even then the patient may have certain sensation like tingling.

	Nerves	Chronaxie time (msec)
Unmyelinated	C	0.40
Myelinated	Aδ	0.17
Myelinated	Aα	0.05-0.10

Chronaxie of different nerves

The **threshold current** is described as the smallest current that causes a motor response. 0.2-0.5 mA may be indicated for a block which is successful, but such values of current cannot be considered to reliably denote the distance between the nerve and the needle. By the use of ultrasound technique, it is demonstrated that even when the needle lies nearer to the nerve, motor responses would not be recorded sometimes, even when the currents as large as 1.5mA.

Nerve stimulators are manufactured so that it can discharge current in a consistent manner. For instance, the current in between the two electrodes of the nerve stimulator always remains the same, even when the resistive properties of the tissues around the nerve vary. The current output may be in a range from 0.01mA to 5mA. The output of the current can be manipulated using a knob on the peripheral nerve Stimulator or a

foot paddle. Nowadays, control settings manipulated by remote control have come into use.

Distance

Coulomb's law states that E= K(Q/r2), E is the intensity of the stimulus, K is a constant, Q is the smallest current delivered from the tip of the needle and r is the distance from the origin of the stimulus to the nerve. The minimal amount of current that is needed to induce the nerve is in direct proportion to the square of the distance from the nerve. Therefore, with a current of low strength, the nerve can be induced only when the stimulator needle is nearer to it.

Polarity

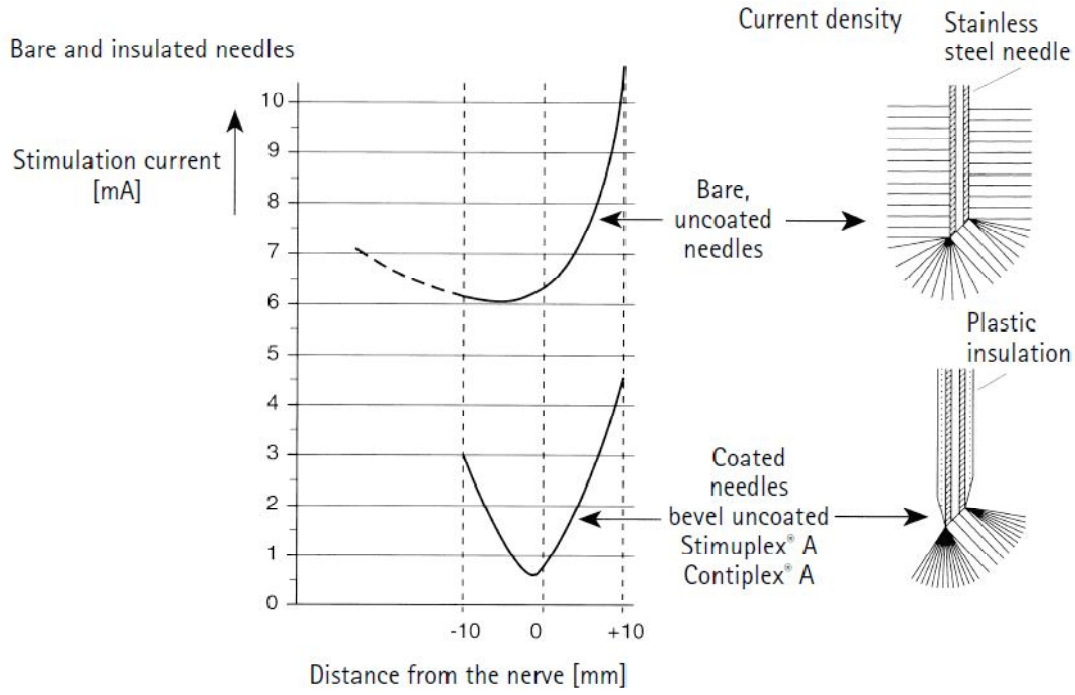
Most of the newer nerve stimulators have negative electrode as the needle. Having the needle as the negative electrode is good because if it is positive (anode), there will be hyperpolarization of the nerve fibre , huge current may be required to cause depolarization of the nerve in order to get a response.

Frequency

The typical parameter for a stimulating conveniently is one to two Hertz. Larger frequency provides repeated response to the operating personnel, but may be severely uncomfortable to the patient.

Needles used for stimulation

Previously needles without insulation were applied for stimulation of nerves, now at present, needles with insulation were advised and are generally used. In a needle with insulation, the entire stem is on insulation with the exception of the tip of the needle.



Comparison of non-insulated and insulated needle and their respective stimulation

In this figure, it is seen that the current is leaking out all along the needle shaft with bare uninsulated needles. Conversely, in Insulated needles current is emitted only from the needle tip. Hence, for uninsulated needles a higher stimulation current is needed when comparing with a needle with insulation in order to get a neural response.

The stimulating current is delivered only at the tip indicates that insulated needles are very much precise and one can have the knowledge about the tip of the needle, depending upon the nerve being under stimulation. There will be a quick rise in the current when using needle with insulation when the needle moves away from the nerve. But with non-insulated needles, when the distance increases, the stimulating current changes gradually. This determines greater accuracy of the insulated needle. In non-insulated needles, current will be leaking from the shaft, as a result the motor response can be elicited only when the tip of the needle is beyond the nerve. Stimulator needles are available in various dimensions (25-150 millimetre) and gauges (20 -25gauge) from a number of manufacturers. The needle length utilised depends on how deep the nerve to be stimulated is present. Most of the needles is provided with graduations to measure how long the needle has to be introduced inside. The tip of the needle can be angled at 15 or 30 degrees. For continuous nerve blocks, catheters can be inserted through special insulated needles having Tuohy tip or using a catheter over needle technique. In certain catheters, current may be delivered at the tip of the catheter to determine terminal placement of the catheter. The catheters are known as stimulating catheters.

Using a Peripheral Nerve Stimulator for Peripheral Nerve Blocks

The instrument should be thoroughly examined before initiating and should be fixed to a desirable initial current (1-2mA), frequency (2Hz), duration of the pulse (0.1ms). The needle is introduced into the negative electrode of the stimulator and the positive electrode is fixed to the patient using an ECG electrode kept on the patient. The syringe loaded with the local anaesthetic is attached to the tubing of the needle which is flexible. Both the needle and the tubing are filled with solution containing LA. With conventional anatomical landmarks, the site of insertion of the needle is found out. There should be an alarm audible or visual to identify the completion of the circuit. The needle selected for stimulation is introduced till a motor twitch which is desirable is reached. The current used is decreased slowly upto a point where there is no motor response. The current observed in mA is monitored. The range of the current about 0.2 to 0.5 milliampere is considered as threshold current. Current level under 0.5 mA results in better success rate and level of current less than 0.2mA denotes the presence of the tip of the needle in the nerve. If so, withdraw the needle slightly before administering LA.

Before injecting the local anaesthetic, aspiration should be done to ruleout the presence of the needle intravascularly and administration of local anaesthetic drug can be carried out in doses of 5ml increments,

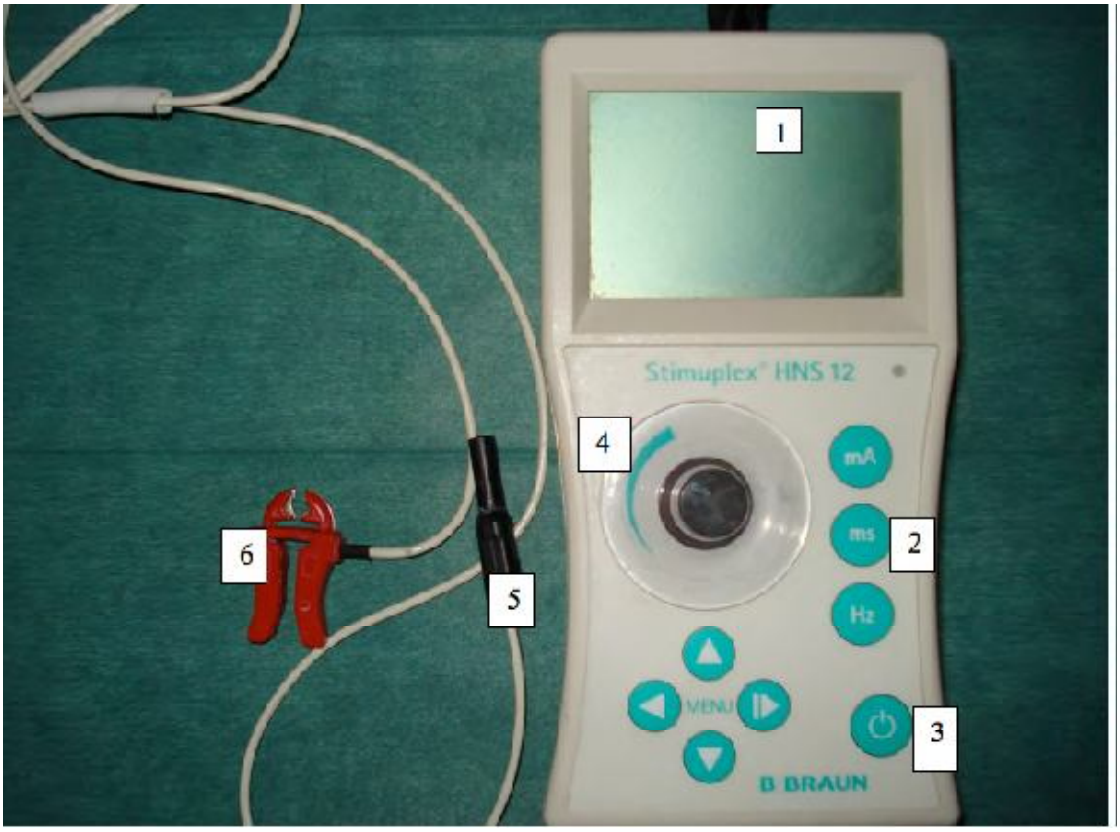
avoiding the displacement of the tip of the needle. There will be a disappearance of the motor twitch observed after administration of 0.5 to 1 ml of local anaesthetic.

This may be caused by alteration of nerve conductivity or dislodgement of the nerve away from the insulated needle used for stimulation (Raj test). Absence of fading of the twitch , pain during administration of LA, difficulty or elevation of pressures on drug administration indicates presence of the tip with in the nerve sheath which may require minimal withdrawal of the tip of the needle (0.5 - 1mm).

Features of a peripheral nerve stimulator:

1. Consistent discharge of the current.
2. Capability of the stimulator to discharge pulse at varying intervals (0.1-1ms)
3. Monophasic pulse having rectangular output (i.e) the passage of current occurs in a single direction. Shape is rectangular in this type.
4. Flow of current is visible digitally.
5. Safety alerts like audible alarms when the circuit is out of connection, indicators for decrease in battery level and alarms which indicate dysfunction should be present.

6. Cathode and anode must be attached well. In newer instruments, nerve stimulators could be connected only to the cathode.



A typical electronic nerve stimulator

1. The display screen shows the current which is set, delivered and also frequency, duration of the stimulus applied.
2. Buttons to change current, stimulus length and also frequency.
3. On/Off switch.
4. A Dial to scroll the settings up and down.
5. Cathode which is black coloured should be attached to the needle
6. Anode which is red coloured should be attached to an ECG electrode sticked on the patient's skin, away from the site of needle insertion.

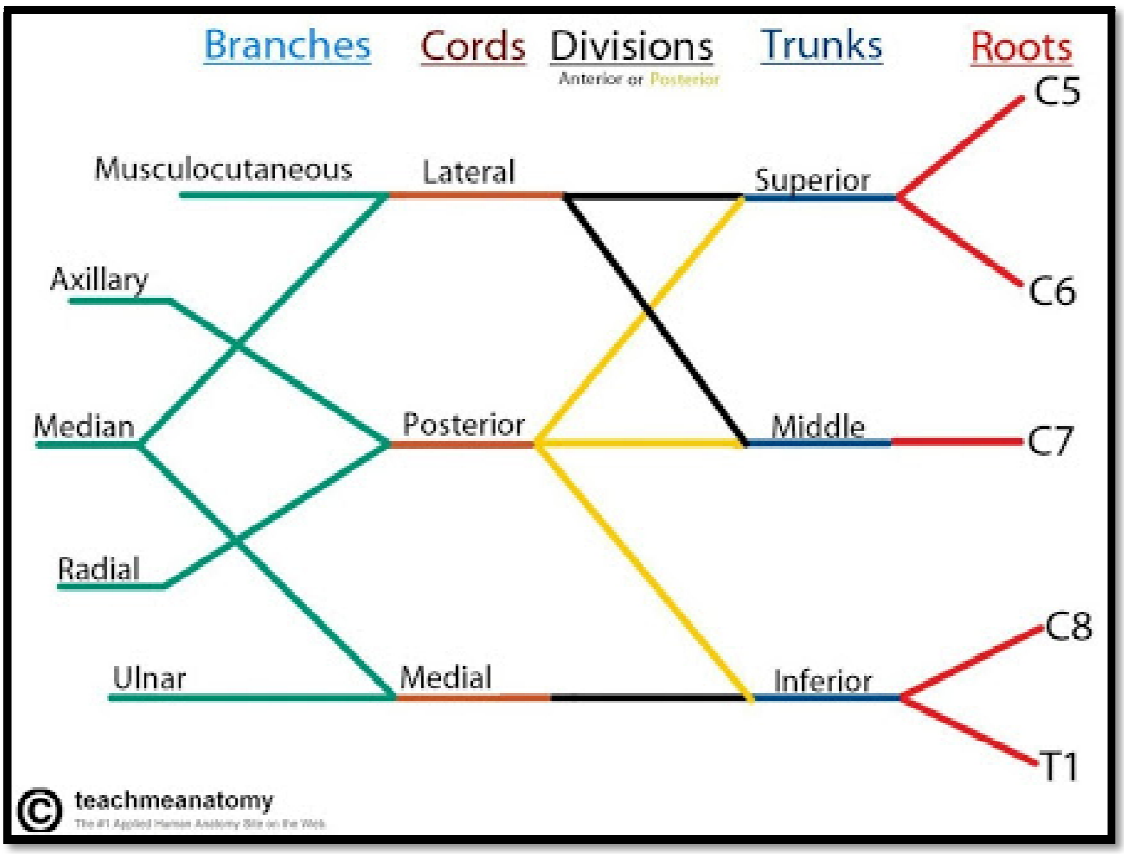
ANATOMY OF BRACHIAL PLEXUS[7-11]

A thorough knowledge of brachial plexus anatomy and its distribution is essential for the precise and effective use of brachial plexus block for surgeries of the upper limb. Also understanding the vascular, muscular and fascial relationships of the plexus throughout its formation and distribution is equally essential in order to minimize complications and better anaesthesia.

The brachial plexus is formed by anterior primary rami of the 5^{th} to 8^{th} cervical nerves and 1^{st} thoracic nerves. There is frequently a contribution from 4^{th} cervical (prefixed) above and 2^{nd} thoracic nerve (postfixed) below. These nerves unite to form trunks, which lie in the neck above the clavicle. Its roots pass through the fascia enclosed space between the scalenus anterior and the scalenus medius muscle. It is accompanied by the blood vessel. It enters the fascia over the muscle and forms the neurovascular bundle. This fascia becomes the axillary sheath in the axilla.

The brachial plexus innervates the upper limb. The plexus can be divided as

1. Roots
2. Trunks
3. Divisions
4. Cords
5. Branches



Relations of brachial plexus

Anterior relations

The anterior relations are the skin, superficial fascia, platysma and supraclavicular branches of the superficial cervical plexus, the deep fascia and external jugular vein.

Posterior relations

Scalenus medius and the long thoracic nerve of bell form the posterior relations.

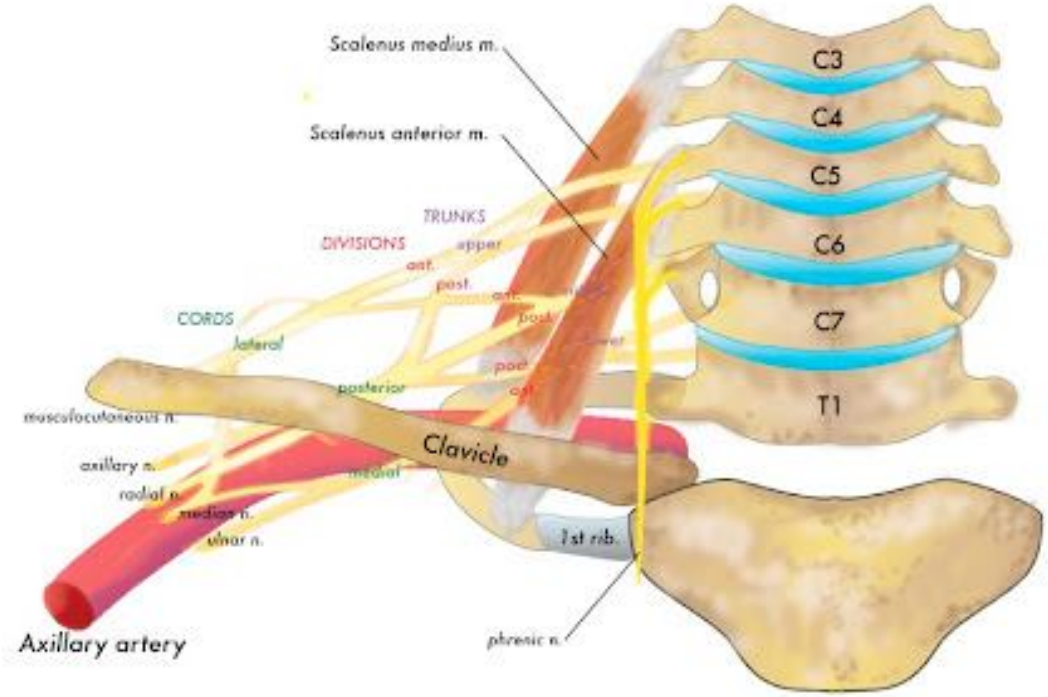
Inferior relations

Inferiorly it is related to the first rib.

Superior relations

It lies first above and subclavian artery lie lateral to this.

Inferior and middle cervical sympathetic ganglion gives Sympathetic contribution to the plexus.



Relations of the brachial plexus

The brachial plexus comprises of nerves (the ventral rami) from C_5-T_1. C_5 and C_6 nerve roots join to form the *"upper trunk";* C_7 nerve root alone forms the *"middle trunk"* and C_8-T_1 nerve roots join to form the *"lower trunk"*. Each trunk further divides into anterior and posterior divisions which finally form the cords. These then divide further into branches which supply the muscles of the arm.

The axons in every nerve root innervate many different muscles. Each muscle can be innervated by 1-5 segments or the nerve roots. The upper nerve roots innervate the upper part of the arm, while the lower nerve roots innervate the lower part of the arm. The brachial plexus comprises of roots, trunks, divisions and cords.

Roots:

The anterior primary rami of the spinal nerves C_5-C_8, T_1 represent the brachial plexus roots. These roots emerge out of the transverse processes of the each cervical vertebra posterior to the vertebral artery, and then passes in a cephalo-caudal direction via the transverse foramina. Anterior and posterior tubercles are present in every transverse process, these laterally join forming costo-transverse bar. The transversalis foramina is found medial to the costo-transverse bar and lies in between the tubercles.

The spinal nerves forming the brachial plexus pass in caudal and anterior directions. The C5 root gives rise to dorsal scapular nerve which traverses through the scalenus medius muscle and innervate the rhomboid muscle and also the levator scapulae. The nerve that supplies serratus anterior (long thoracic nerve) originates from C_5-C_7 cervical nerve roots and passes through the scalenus medius muscle while travelling behind the brachial plexus.

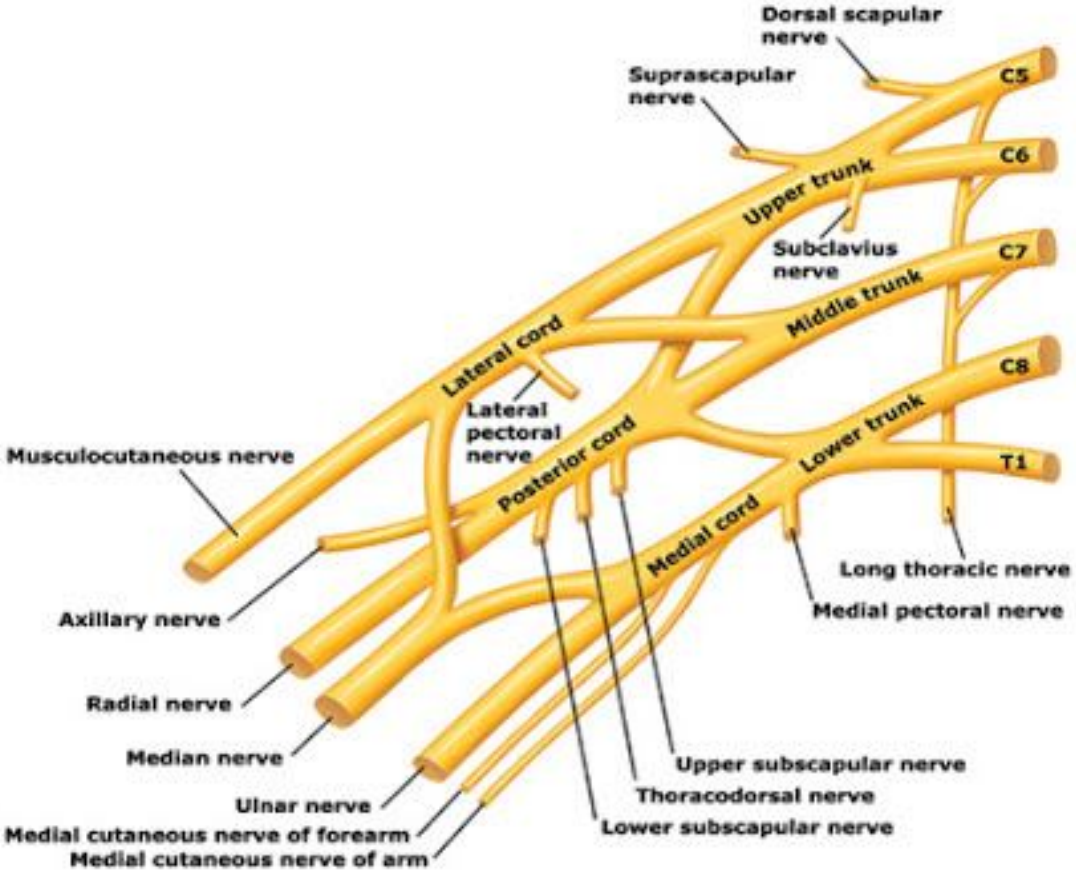
Trunks and divisions:

The trunks of the plexus traverse between scalenus anterior and scalenus medius muscles. C_5 and C_6 roots form the superior trunk which is found closer to the surface. The superior trunk gives rise to nerve to subclavius and the suprascapular nerve . Shoulder joint receives sensory fibres from the suprascapular nerve whereas supraspinatus and infraspinatus receive motor supply. The middle trunk is formed by C_7 nerve root and the inferior trunk by $C_{8,}$ T_1 roots. The trunks thus formed further splits into ventral (anterior) and dorsal (posterior) divisions.

Cords and branches

The cords are named the lateral, posterior and medial cord, according to their relationship to axillary artery. The ventral divisions of the superior and middle trunks form the lateral cord and gives rise to the lateral pectoral nerve (C_5 –C_7). The posterior cord is derived from all the

posterior divisions of the three trunks and the medial cord from the inferior trunk. The median pectoral nerve (C_8, T_1), the medial brachial cutaneous nerve (T_1) and the medial ante-brachial cutaneous nerve (C_8, T_1) arise from the medial cord.



Branches

From roots

- Nerve to serratus anterior C5 – C7
- Muscular branches to long cervices C5 – C8
- Nerve to the three scalene muscles C5 – C8

- Nerve to rhomboids C5
- A twig to phrenic nerve C5.

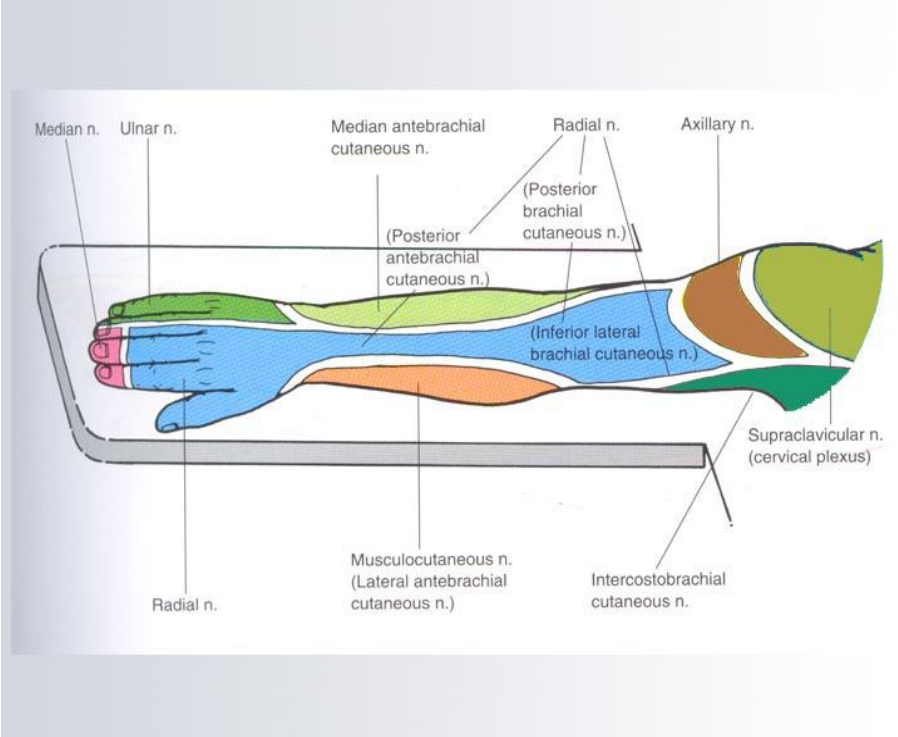
From trunks

- Suprascapular nerve C5 & C6
- Nerve to subclavius C5 & C6

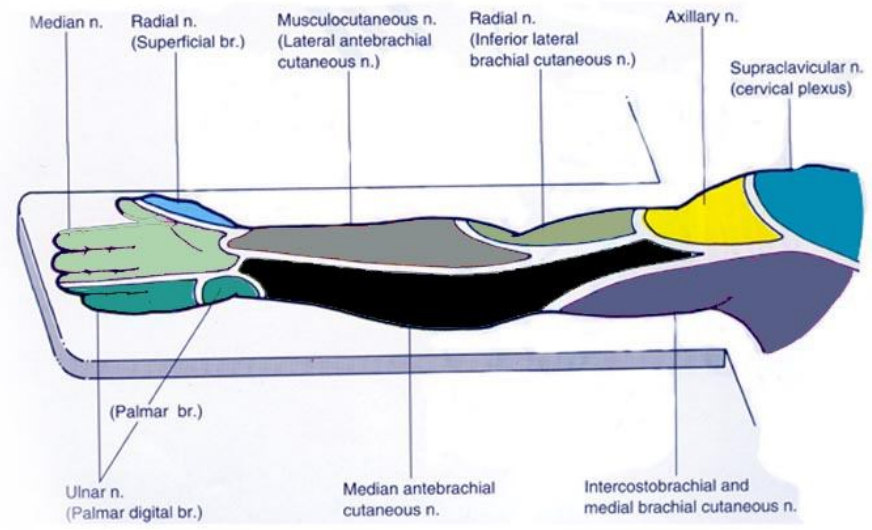
BRANCHES OF INFRACLAVICULAR PART OF BRACHIAL PLEXUS

• **Lateral cord**	Musculocutaneous nerve(C5,C6)
	Lateral pectoral nerve (C5,C6)
	Lateral root of median nerve (C5,C6)
• **Medial cord**	Medial cutaneous nerve of arm (C8,T1)
	Medial cutaneous nerve of forearm(C8,T1)
	Medial root of median nerve(C8,T1)
	Medial pectoral nerve (C8,T1)
	Ulnar nerve(C7,C8,T1)
• **Posterior cord**	Upper subscapular nerve(C5,C6)
	Lower subscapular nerve(C5,C6)
	Nerve to latissimus dorsi (C6,C7,C8)
	Axillary nerve(C5,C6)
	Radial nerve(C5,C6,C8,T1)

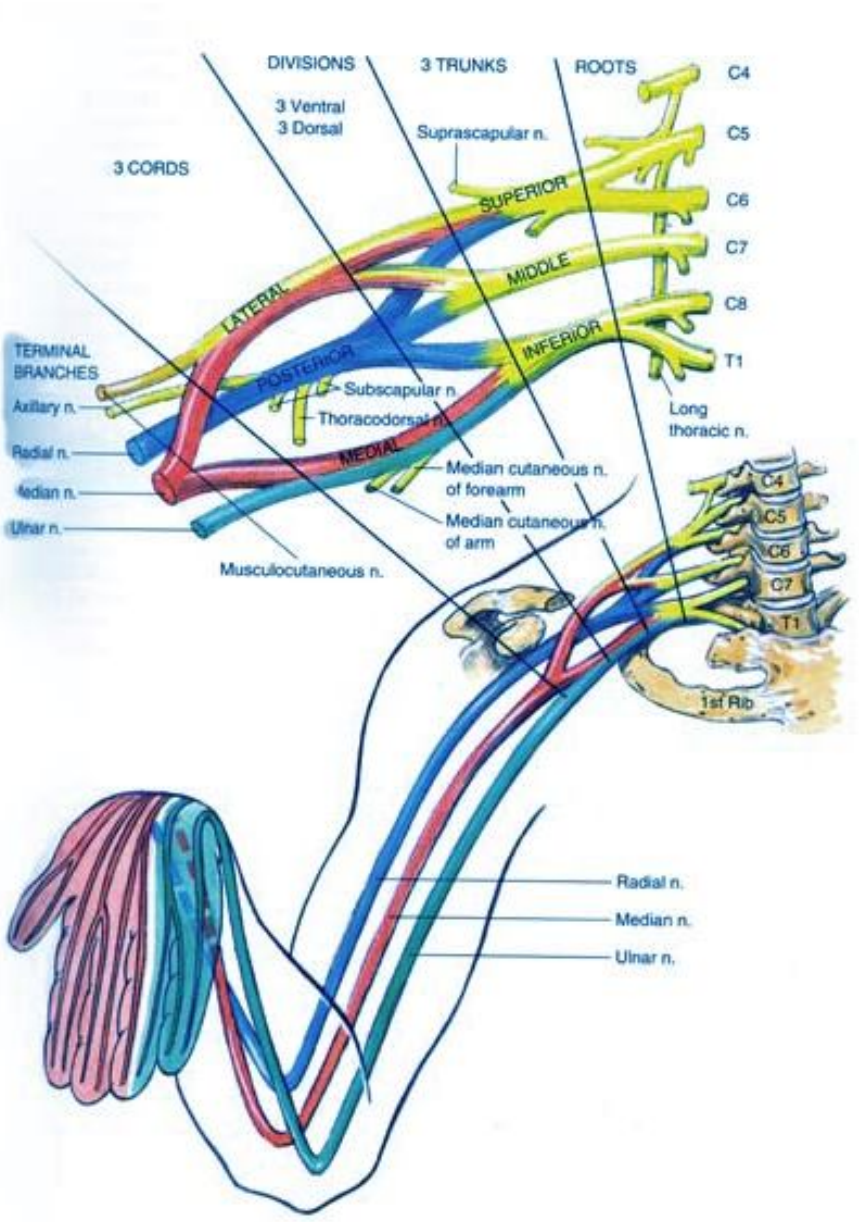
Sensory innervation of upper limb



Sensory innervation of upper limb



Anatomical illustration of the brachial plexus

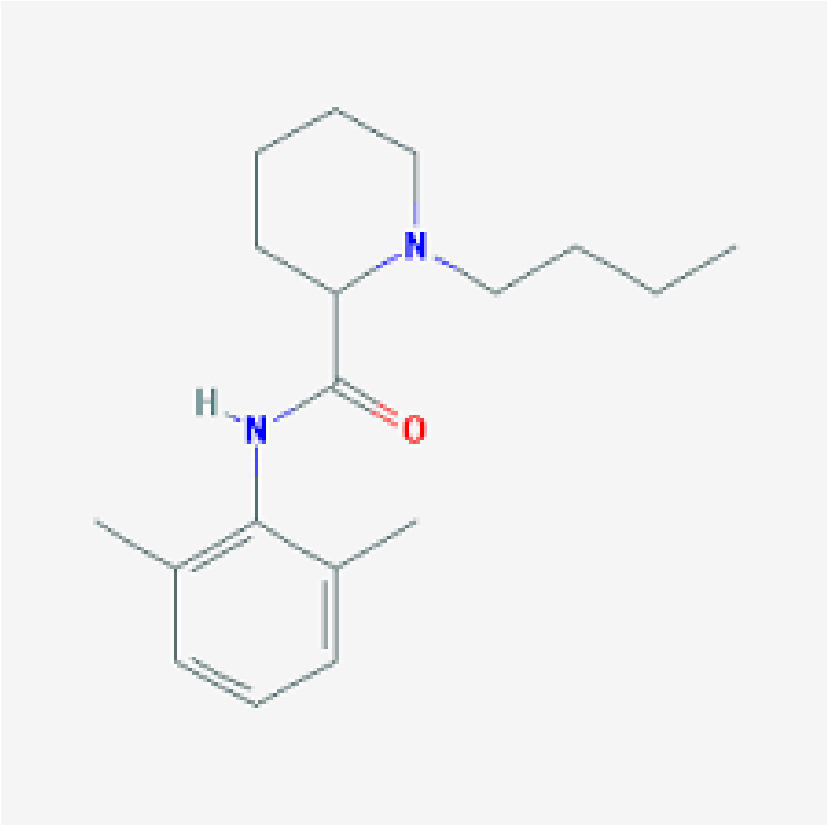


CLINICAL PHARMACOLOGY

PHARMACOLOGY OF BUPIVACAINE

Bupivacaine is chemically a crystalline, whitish, powdery crystals. It dissolves in H_2O, readily dissolves in ethanol (96%), dissolves in chloroform and in ether. The pKa of Bupivacaine is 8.1 and its lipid solubility is more when compared to lignocaine.

It is related chemically and pharmacologically to the amino amide class of local anaesthetic drugs.



Molecular structure of bupivacaine

Bupivacaine prevents sodium ions influx through the nerve membrane, thereby reversibly blocks the propagation of impulse along nerve fibres. Amide type of Local anaesthetic drugs act inside the Na^{2+} channels of the neural sheath.

Pharmacokinetics

Bupivacaine is an amide local anaesthetic drug which is long acting, related chemically to lignocaine and mepivacaine. It is four times more potent and more toxic than lignocaine. 0.5% bupivacaine has a longer duration of action. Following a single epidural injection, it acts upto 5 hours and following peripheral nerve blocks, acts upto 12 hours. But the onset of nerve block is slower when compared to lignocaine, particularly while anaesthetising large nerves. In concentrations of 0.25% (2.5 mg/mL or less), Bupivacaine has lesser motor effect and also shorter duration of action. However, lower concentrations have the advantage of providing prolonged analgesia especially in labour and in post operative period.

Dose of Bupivacaine injected, the route of drug administration and also the vascularity of the injection site determine the plasma concentration of Bupivacaine.

The duration of action can be prolonged by adding vasoconstrictors like adrenaline to the local anaesthetic solution as rate of absorption decreases.

Maximum levels in blood are achieved in 30 - 45 minutes after caudal, epidural, nerve blocks and decrease in plasma concentrations occur in next 3 to 6 hours. Highest peak plasma concentration are seen with intercostal nerve blocks as a result of rapid absorption (after a dose of 400mg , highest plasma levels are achieved about 1 to 4 milligram/L). The lowest plasma concentrations are seen in subcutaneous abdominal injections. Epidural blockades and major nerve plexus blocks have intermediate concentrations. In pediatric age groups, rapid absorption (after a dose of 3 mg/kg ,plasma levels are in the order of 1 to 1.5 mg/L) is found with caudal block. Addition of vasoconstrictors like adrenaline slows down absorption. Bupivacaine has a total plasma clearance of 0.58 L/min, a volume of distribution at steady-state of 73 L, an elimination half-life of 2.7 hours (range 1.5 to 5.5 hours) and an intermediate hepatic extraction ratio of 0.40 following experimental IV administration in adults. The terminal elimination half-life is prolonged in the newborn to approximately 8 hours (range 8.1 to 14.0 hours). In children aged over 3 months the elimination half-life is similar to that in adults.

Bupivacaine is mainly bound to α1-acid glycoprotein in plasma with a plasma binding of 96%. A rise in α1-acid gp, which happens after major surgical procedure, can lead to a rise in the total plasma levels of bupivacaine. The concentration of unbound drug may be the same. Bupivacaine is eliminated by the kidneys mainly as breakdown products with around 6% as the parent drug. After epidural injection, bupivacaine is recovered without any change in approximately0.2%, of pipecolylxylidine (PPX) 1% approximately and of 4-hydroxy-bupivacaine about 0.1% of the injected dose.

Pharmacodynamics:

Bupivacaine decreases permeability of the nerve membrane to sodium ions thereby blocking the transmission of nerve impulses and this in turn inhibits depolarization of the membrane thereby causing blockade of conduction. Bupivacaine acts by increasing the threshold for electrical excitation of the nerve membrane, slows down impulse propagation and also decreases the frequency of action potential, thereby inhibits nerve impulse generation as well as conduction.

Diameter, myelination and conduction velocity of nerve fibres determine the progression of anaesthesia. Larger fibres are less sensitive than smaller fibres and need a much shorter period for recovery when compared to smaller fibres. Fibres carrying pain sensation are blocked

first, followed by fibres carrying sensations of temperature, touch, and deep pressure. Myelinated nerves are blocked more readily than unmyelinated nerves.

USES:

Bupivacaine is used for providing local or regional anesthesia or analgesia for most surgeries, dental and oral surgical procedures, diagnostic and therapeutic procedures and also for obstetrical procedures.

local infiltration	0.25%
peripheral nerve block	0.25% and 0.5%
retrobulbar block	0.75%
sympathetic block	0.25%
lumbar epidural	0.25%, 0.5%, and 0.75% (0.75% not for obstetrical anesthesia)
caudal	0.25% and 0.5%
epidural test dose	0.5% with epinephrine 1:200,000

Contraindications

Bupivacaine is contraindicated for providing paracervical block for obstetric procedures. It has been demonstrated to produce bradycardia and even death in fetus. Bupivacaine is contraindicated in patients known to have hypersensitivity to bupivacaine or to any amide type local anesthetic agent or to any other component of Bupivacaine.

REVIEW OF LITERATURE

Upper limb surgeries can be carried out using various approaches of brachial plexus block. Infraclavicular approach of brachial plexus block can be used for surgeries of the forearm, wrist, and hand because with a single puncture all the sensations of the distal part of upper limb can be block. In 1922, Labat described about the infraclavicular block and in 1973 Raj et al altered the technique. Sims in 1977 to improved the reliability of landmarks.

Vikas trehan[12] et al compared two approaches of infraclavicular block using nerve stimulator for surgeries below mid humerus. They concluded that the two approaches were equal in terms of clinical success rate, tolerance to tourniquet and also safety. But Coracoid approach was found to be superior to clavicular because positioning of the limb was easier and also there was no difficulty in identifying the coracoid process.

K.Whiffler[13] et al conducted a prospective randomized controlled trial of infraclavicular block using coracoid approach. They found that compared with supraclavicular approach pulmonary complications do not occur and compared with axillary approach a higher level of analgesia can be obtained.

J.Desroches[14] et al conducted a study to describe the sensory distribution, motor blockade and clinical efficacy of infraclavicular

approach of brachial plexus block by coracoid approach. They concluded that this approach of infraclavicular block has very good tolerance to tourniquet and produces extensive sensory blockade and consistent anesthesia for surgeries of the upper limb.

A Borgeat[15] et al found that the modified Raj technique for performing the Infraclavicular block is an easy to learn since landmarks are easy to identify, provides better conditions for catheter placement, complications like pneumothorax are less.

K J Chin[16] et al conducted a study to compare other approaches of the brachial plexus with infraclavicular approach in terms of safety and efficacy. They concluded that for lower arm surgeries infraclavicular block provides efficient anaesthesia like other techniques and is also simple to learn and perform. Also tourniquet pain and discomfort during block is very less.

M Neuburger[17] et al conducted a clinical trial on efficiency of vertical approach of infraclavicular block for providing brachial plexus anaesthesia with use of peripheral nerve stimulator and found that complications like nerve lesions or pneumothorax doesnot occur. The vertical approach using nerve stimulator is an easy and simple technique for providing brachial plexus anaesthesia and very easy to master.

HG Kilka[18], P Geiger et al found that infraclavicular brachial plexus block using vertical approach is a successful technique when compared to other techniques. It also provides excellent tourniquet tolerance of the upper arm for longer period of time. Onset of complete nerve block is achieved faster and this technique also provides longer period of analgesia postoperatively. Lower risks and high patient acceptance makes this technique a better one.

B Jose maria[19] and LKP Tielens conducted a study to find efficacy of vertical infraclavicular block in pediatric patients undergoing trauma surgery and concluded that vertical approach was easy to perform, effective and free of major complications.

Jandard, C[20]. et al found that single injection infraclavicular block using a vertical paracoracoid approach using nerve stimulator is suitable for surgery distal to elbow.

Z Ertung[21] et al conducted a clinical trial on comparison of axillary approach and infraclavicular approaches of brachial plexus blockade for surgeries involving forearm and arm and concluded that both the techniques are equal in terms of safety and efficacy. But infraclavicular approach is preferred to the axillary approach in terms of mobility.

Admir Hadzic[22] et al in their study found that infraclavicular block with short acting local anaesthetic produced time efficient anaesthesia, faster recovery, fewer adverse effects, better analgesia, and greater patient acceptance than GA followed by local anaesthetic in outpatients undergoing hand and wrist surgery.

P Bigeleisen[23], M Wilson compared two techniques of infraclavicular block using ultrasound technique and found that the medial approach is faster and easier to perform, has lower incidence of tourniquet pain and vascular puncture.

Chun woo yang[24] et al compared supraclavicular brachial plexus block and infraclavicular brachial plexus block using a nerve stimulator and found that both the approaches had similar efficacy and also infraclavicular block might be preferable for hand, forearm, and elbow surgeries since pneumothorax was reported in supraclavicular block in this study.

Lecamwasam[25] et al conducted a study on the basis of locating the posterior cord while performing a single injection infraclavicular technique will locate the Needle almost centrally within the infraclavicular part of the brachial plexus and permits even spread of local anaesthetic solution. They showed that stimulating the posterior cord results in more frequent success rate than stimulation of the medial

cord or lateral cord. They defined clinical success as rapid onset of motor blockade and sensory blockade that is adequate to perform surgery.

N S Sandhu[26] et al conducted a clinical trial on ultrasound guided infraclavicular brachial plexus block. In this study clinical success rate is taken as surgery under infraclavicular block without any need for supplemental anaesthetic or conversion to general anaesthesia. They concluded that use of ultrasound technique has the potential to improve the success and decrease complications of infraclavicular block.

ZJ Koscielniak[27] et al evaluated the clinical utility and block success rate of lateral sagittal infraclavicular block taking clinical success rate as conduct of surgery without any additional local anaesthetic supplementation. They concluded lateral sagittal infraclavicular block provided a clinically acceptance success rate.

S Kapral[28], O Jandrasits et al conducted a clinical trial on comparison between lateral infraclavicular block(group I) and axillary block(group A) for hand and forearm surgery. Group I is better in blocking musculocutaneous and also axillary, thoracodorsal and medial brachial cutaneous nerves when compared to group A.

Sebastian Bloc[29] et al conducted study to evaluate the rate of success when infraclavicular block was given by a single injection with the guidance of a distal motor response evoked electrically. They found

that rate of success of infraclavicular block by single injection was highly determined by a distal motor response . The success rate was found to be higher when local anaesthetic was injected after a motor response of radial nerve.

Gaertner and Elisabeth[30] conducted a study to find the success rate of coracoids approach of infraclavicular block that is done using nerve stimulator when 1 or 3 motor responses are evaluated. They found that there was minimal increase in duration of block in multistimulation group. Also the success rate of anaesthesia is found to be more in the multistimulation group.

Deleuze[31] and Arnaud compared single stimulation lateral infraclavicular block with triple stimulation axillary block. The complete block in median, radial, ulnar, musculocutaneous, and medial antebrachial cutaneous nerves was taken for clinical success rate and they concluded that single shot ICB is equally effective as a triple nerve stimulation axillary block.

Arcand G[32] et al conducted a study to compare supraclavicular approach and infraclavicular approach of the brachial plexus block using ultrasound technique in time taken to perform the block and the efficacy of block. They concluded that both the approaches are similar in

producing anesthesia and also the time taken for performing block is comparable.

Heid F M[33] et al conducted a study to compare modified approach of axillary block and vertical approach of infraclavicular block and found that both techniques provided sufficient surgical anesthesia,but vertical infraclavicular plexus block demonstrated a partially higher success rate and a faster onset than high axillary block.

Lahori VU[34] et al conducted study to compare axillary block and infraclavicular block on their efficacy using a nerve stimulator for surgeries of the upperlimb. They concluded that both the approaches are comparable, but the VIB scores ahead of axillary block in terms of its ability to block more nerves. The VIB because of its easily identifiable landmarks, a comfortable patient position during the block procedure and the ability to block a larger spectrum of nerves should thus be considered as an effective alternative to the axillary approach.

Salazar C H[35] conducted a study in infraclavicular block using a variation in approach and found that it produced reliable anesthesia and is associated with minimal complications and side effects.

Gurkan Y[36] et al conducted study on infraclavicular block and supraclavicular block using ultrasound technique to compare time taken for block performance, number of attempts, time of onset of block and

complications. Similar block features were observed with infraclavicular and supraclavicular approaches, but infraclavicular block may be preferable to supraclavicular block due to the lower incidence of transient adverse events.

Ootaki C[37] et al compared ultrasound guided and anatomical landmark guided blind techniques of infraclavicular block and concluded that real-time ultrasound guidance facilitates accurate infraclavicular approach to the brachial plexus. It could be used as an alternative to the landmark-guided techniques.

Koscielniak – Nielsen ZJ[38] et al compared infraclavicular and axillary blocks in terms of discomfort during performance of block. They also assessed pain during passage of needle, while injecting local anesthetic drugs and using nerve stimulator, complications and analgesia. They found that efficacy of block, time of onset and patient acceptance were equal in both the blocks but in terms of discomfort infraclavicular block using single injection seems to be better than axillary approach with multiple injections.

Minville V[39] et al compared the success rate of infraclavicular brachial plexus block by double-stimulation to second nerve response demonstrated with nerve stimulator. They concluded that since musculocutaneous nerve was located and blocked, the subsequent

injection with a radial response gave a better success rate than the one with ulnar or median response.

Chin KJ[40] evaluated the efficacy and safety of infraclavicular block (ICB) compared to other approaches to the brachial plexus in providing regional anaesthesia for surgery on the lower arm. They concluded that efficacy and safety of infraclavicular block is similar to other brachial plexus blocks but infraclavicular block is found to provide better tourniquet tolerance, musculocutaneous nerve blockade and also has shorter time to perform block.

Ponde V[41] assessed efficacy of infraclavicular brachial plexus block both intraoperatively and postoperatively for radial club hand in which motor responses to nerve stimulator are not found because of congenital anomalies. They found that fine twitches of the hand, or wrist or even pronation , supination or surgical area stimulation was enough for a satisfactory block. They also found that it provides sufficient analgesic effect both intraoperatively and postoperatively

MATERIALS AND METHODOLOGY

PATIENT SELECTION:

60 patients of ASA 1 & 2 of both sexes posted for upper limb surgeries from March 2015 to August 2015 at Govt. Kilpauk Medical College Hospital and Govt. Royapettah hospital, formed the group.

INCLUSION CRITERIA:

- Age 18-45 years.
- Patients who undergo upper limb surgery requiring Anaesthesia under ASA Physical Status 1,2.
- Weight 45-70 kg.
- Elective surgery.
- Any Upper limb surgery below mid humerus.
- Patients who are willing to give informed written consent.

EXCLUSION CRITERIA:

- Hypersensitivity to the drug
- Patient refusal
- Chest wall deformities
- Any distortion of local anatomy, Neck contractures

- Local infection
- Coagulopathy
- Patients who are not willing to give written informed consent.
- Pneumothorax
- Pregnancy

Equipments

- Sterile tray
- Sterile towel, gauze packs
- Disposable 10ml syringes, Sterile gloves, marking pen and surface electrode
- 2 ml syringe for skin infiltration
- 50mm long, 22G short bevel insulated stimulating needle
- Peripheral nerve locator

Drugs

- 0.5% Bupivacaine (plain) vial, sterile water

Intraoperative and post operative monitor

- Pulse oximeter
- NIBP
- ECG

A total of 60 patients who come under the above mentioned inclusion criteria were selected. Patients who were selected were counselled about the risks and benefits involved in performing the block. After getting informed and written consent, patients willing to be included in the study were enrolled and analyzed.

Patients were all preoperatively evaluated preoperatively, clinically examined. Proper investigations were done prior to the assessment. Procedures were explained in detail and written consent was obtained.

All patients were kept in nil per oral state atleast for 8 hours before taking up for the procedure. Local anaesthetic test dose was carried out using 0.1 ml of Inj. Lignocaine 2%. Intravenous access was obtained with 18G IV cannula. Inj. Ranitidine 50 mg and Inj. Ondansetron 0.1 mg/kg were given intravenously. All patients were pre medicated with Inj. Midazolam (0.02 – 0.05 milligram/kg) intravenously 10 minutes before the procedure.

This study was designed as a prospective, randomized comparative study. The present study comprised of 60 patients, divided randomly into two groups with 30 patients each.

GROUP A: 30 patients receiving infraclavicular block of brachial plexus using lateral corocoid approach.

GROUP B: 30 patients receiving infraclavicular block of brachial plexus using medial clavicular approach.

The procedure was performed in the preparation room or in the theatre. Boyle machine, suctioning equipment, laryngoscope handles and blades, Endotracheal tubes, Laryngeal mask airways, Manual resuscitation bag with mask and reservoir were kept ready. Routine monitoring with ECG, Pulse Oximetry, NIBP was done.

In 30 patients belonging to group A, infraclavicular block of brachial plexus was carried out using lateral coracoid approach. In this group, the patient's upper limb to be operated was kept in neutral position along the side of the body. Under strict aseptic precautions, identification of the coracoid process was done and a point about 2 cm inferior and 2 cm medial to coracoid process was labelled and about 1-2 ml of 1% lignocaine infiltration was done at the point of insertion of the needle. Insulated stimulating needle was then inserted at right angles to the skin.

In 30 patients belonging to group B, infraclavicular block of brachial plexus was performed using medial clavicular approach. Patients were positioned in supine lying position with the arms in neutral position along the side of the body, a point was marked which bisects line connecting the jugular notch and ventral acromial process of scapula and. In fossa axillaris, the point of emergence of axillary artey was marked. In

order to carry out the block, upperlimb was abducted to 90 degrees and elevated to 30 degrees approximately with a pillow. Then, a point was labelled about 1cm caudal to the inferior border of the clavicle at the midclavicular line. Infiltration of 1% lignocaine was done with 1-2 ml. The insulated needle was then inserted with 45 – 60 degrees angulation to the skin directed laterally towards the point of emergence of axillary artery in the axilla, making sure to lie to the lateral border of Pectoralis Major.

In both the study groups, the infraclavicular block was given with the guidance of a nerve stimulator which was attached to the proximal point of 50mm, 22 G insulated stimulator needle. Then the needle was proceeded till there was a response from a muscle distal to the deltoid. To start with, the current was kept at 2.0mA and gradually decreased. The needle was further forwarded until the distal motor response was able to be elicited with 0.5 mA current. Then, slow injection of 25ml – 30 ml of 0.5% bupivacaine was done with intermittent aspiration.

Following parameters were observed:

1. Duration of surgery (in minutes)
2. Depth of insertion (in cms) : measured as the distance between the site of needle puncture and the site of injection of the drug
3. Time taken to perform block (in minutes)

4. Time taken for the onset of sensory blockade (in minutes):

   Using a 26-G needle, sensations provided by median, radial, ulnar, musculocutaneous and also the medial cutaneous nerve of arm were evaluated.

5. Time taken for the onset of motor blockade (in minutes)

6. Discomfort during blockade:

   Discomfort during positioning or insertion of the needle were observed. Discomfort can be graded as:

   0 - nil,
   1 - mild,
   2 - moderate
   3 - Severe

7. Success rate – sufficiency of the block to perform surgery was observed.

   Block was termed as successful when it does not need any supplementation

8. Supplementation needed:

Patients in whom the block was insufficient, were supplemented with either Inj. Fentanyl (2 µ/kg) or local infiltration at the surgical site or converted to general anaesthesia using Inj. Glycopyrrolate (5µ/kg), Inj. Propofol (2mg/kg), Inj. Atracurium (0.5mg/kg loading dose followed by

0.1mg/kg every 30 minutes) and reversed with Inj. Neostigmine (50µ/kg) and Inj. Glycopyrrolate (5µ/kg) at the end of surgery.

9. Tourniquet Tolerance: assessed by using the following scale.

    0 - no sensation,

    1 - sensation, no pain,

    2 - pain

10. Degree of motor blockade:

Motor blockade was assessed as follows:

Grade 1 : able to do flexion and extension of the forearm.

Grade 2 : able to do flexion / extension of wrist and fingers only

Grade 3 : able to do flexion / extension of fingers only,

Grade 4 : unable to move forearm, wrist or fingers.

11. Complications:

Observed for complications like arterial puncture, pneumothorax intravascular injection and Horner's syndrome.

Monitoring the patient was carried out throughout the surgery, after deflating the tourniquet and also in the post operative period using continuous pulse oximetry, ECG, Heart rate and NIBP every 10 minutes for first one hour and every 15 minutes thereafter.

Data obtained in the study were tabulated manner and the variables were represented by mean value ±SD. The statistical significance in mean difference was calculated using analysis of paired t test.

OBSERVATION AND RESULTS

The present study comprised of 60 patients, divided randomly into two groups with 30 patients each.

GROUP A: 30 patients receiving infraclavicular block of brachial plexus using lateral corocoid approach.

GROUP B: 30 patients receiving infraclavicular block of brachial plexus using medial clavicular approach.

Data obtained were subjected to statistical analysis. Two sample T test was used to analyse continuous variables and chi- square test was used to analyse categorical variables. $P<0.05$ was considered to be statistically significant.

Table 1: Age Distribution

Age group	Corocoid approach group A		Clavicular approach Group B	
	No	**%**	**No**	**%**
Upto 20 years	2	6.7	3	10
21-30 years	7	23.3	5	16.7
31-40 years	16	53.3	15	50
> 40 years	5	16.7	7	23.3
Total	30	100	30	100
Range	19-44 years		19-45 years	
Mean	31.8 years		33.07 years	
SD	6.76		7.81	
'p'	0.826 Not significant			

Age distribution in group A was ranging from 19 years to 44 years, with a mean of 31.8 and standard deviation of 6.76, Group B ranged from 19years to 45 years with mean value of 36.6 and standard deviation of 7.81.

The 'p' value was 0.826 and the difference was found to be not significant statistically.

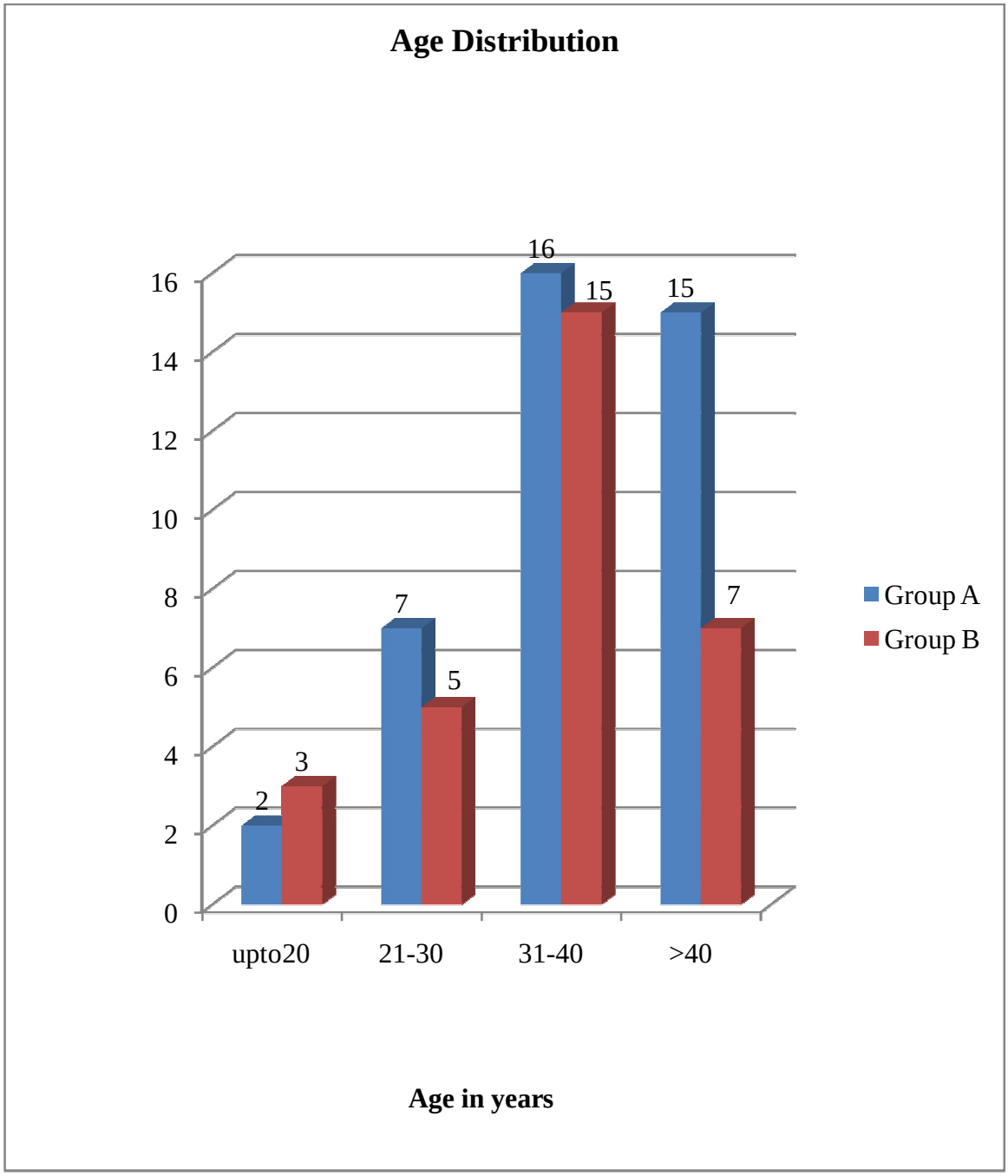
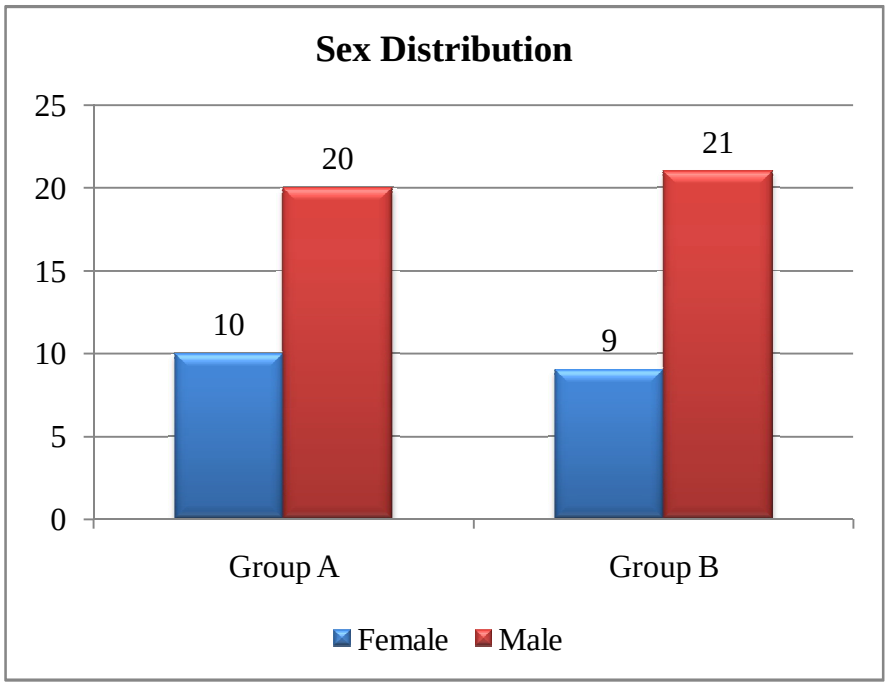

Age Distribution
16
14
12
10
8
6
4
2
0
2
3
7
5
16
15
15
7
upto20
21-30
31-40
>40
Group A
Group B
Age in years

Table 2 : Sex Distribution

Sex	Corocoid approach Group A		Clavicular approach Group B	
	No	**%**	**No**	**%**
Male	20	66.7	21	70
Female	10	33.3	9	30
Total	30	100	30	100
'p'	0.787 Not significant			

In the present study, 20 patients were males (66.7%) and 10 patients were females (33.3%) in group A where as in group B, 21 patients were males (70%) and 9 patients were females(30%), with the 'p' value 0.781($p>0.05$). Hence, it was not significant statistically and also there was no difference that is significant in sex distribution among both the groups.


Sex Distribution
25
20
15
10
5
0
10
20
9
21
Group A
Group B
Female
Male

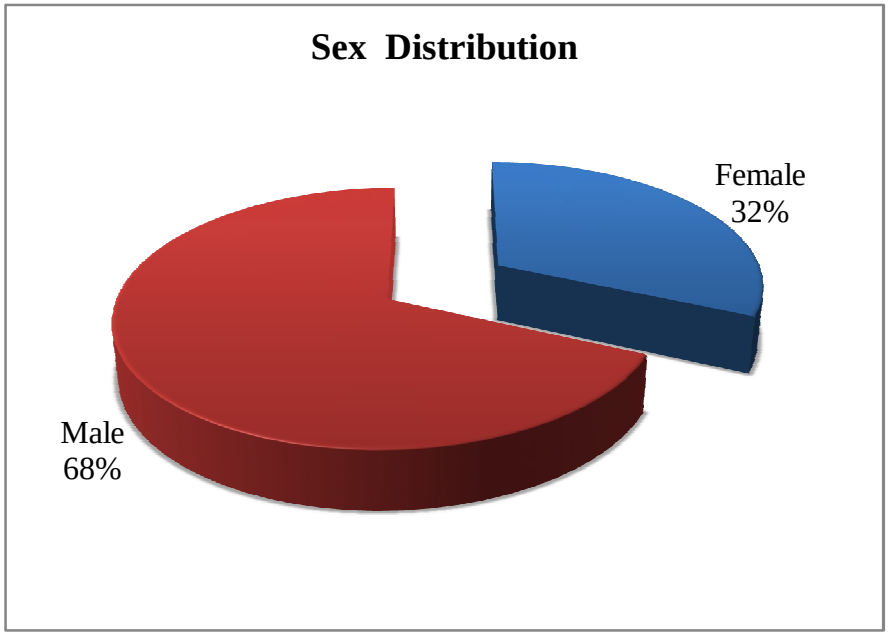

Sex Distribution
Female
32%
Male
68%

Table 3 : Weight distribution

Parameter	Weight (in kgs)	
	Corocoid approach group A	**Clavicular approach group B**
Range	57-65	57-65
Mean	61.17	61.00
SD	2.321	2.435
'p'	0.787 Not significant	

Weight distribution in group A ranged from a minimum of 57kg to maximum of 68kg, with a mean of 61.17 and the standard deviation of 2.321. In group B, weight distribution ranged from 57 to 65kg, with a mean of 61.0 and the standard deviation of 2.435.

The 'p' value was found to be 0.785 ($p>0.05$). Hence, it was not statistically significant and there was no difference significantly in weight distribution among the study groups.

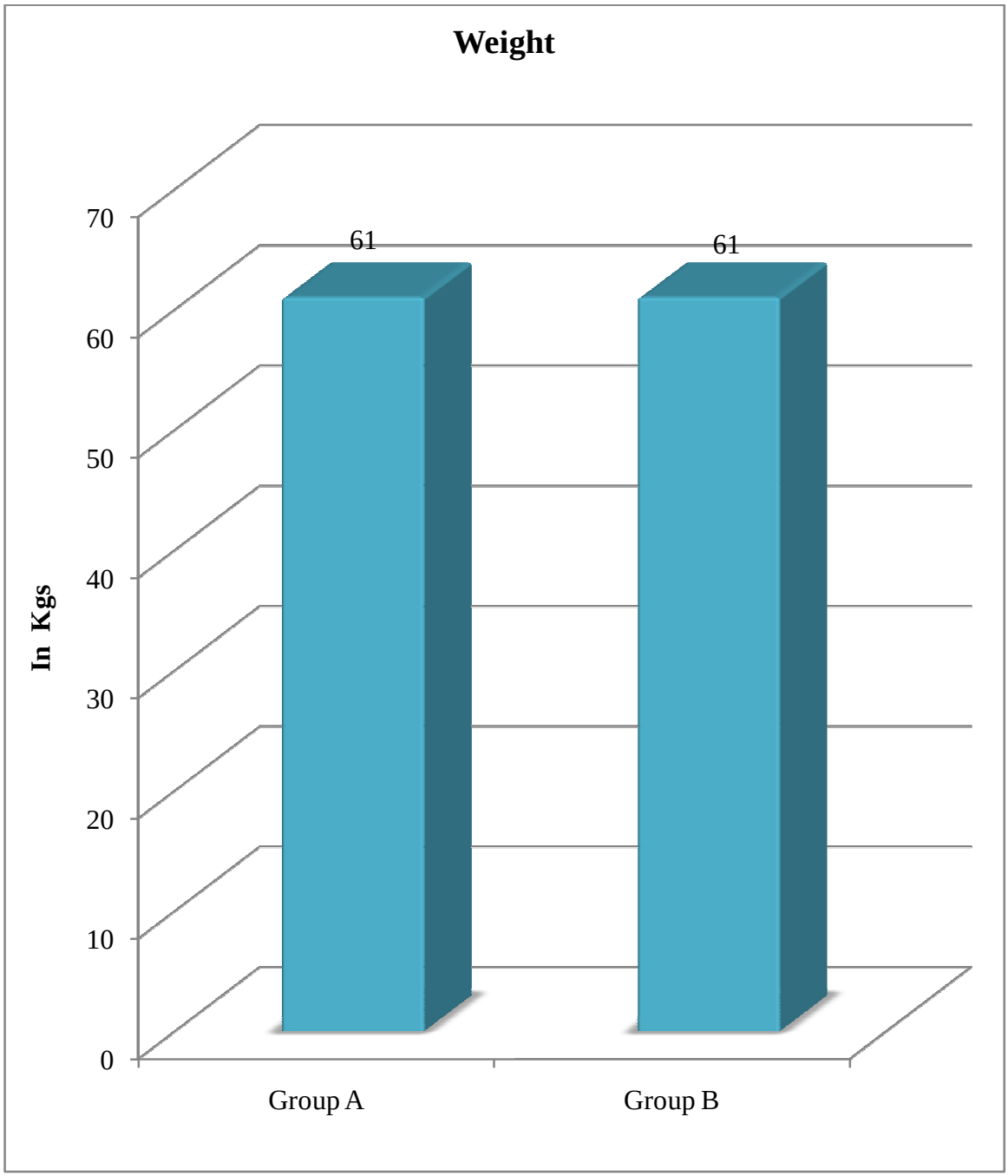

Weight
In Kgs
70
60
50
40
30
20
10
0
61
61
Group A
Group B

Table 4 : Duration of surgery

Parameter	Duration of surgery(in minutes)	
	Corocoid approach group A	**Clavicular approach group B**
Range	75 – 95	75 - 95
Mean	86.17	85.33
SD	6.254	6.149
'p'	0.605 Not significant	

In the present study, duration of surgery ranged from 75 to 95 mins in both the groups, with a mean of 86.33, standard deviation of 6.254 in group A and a mean of 85.33 and standard deviation of 6.149 in group B. The 'p' value was found to be 0.605 (p value>0.05). Hence, the difference observed among the two study groups was found to be statistically not significant.

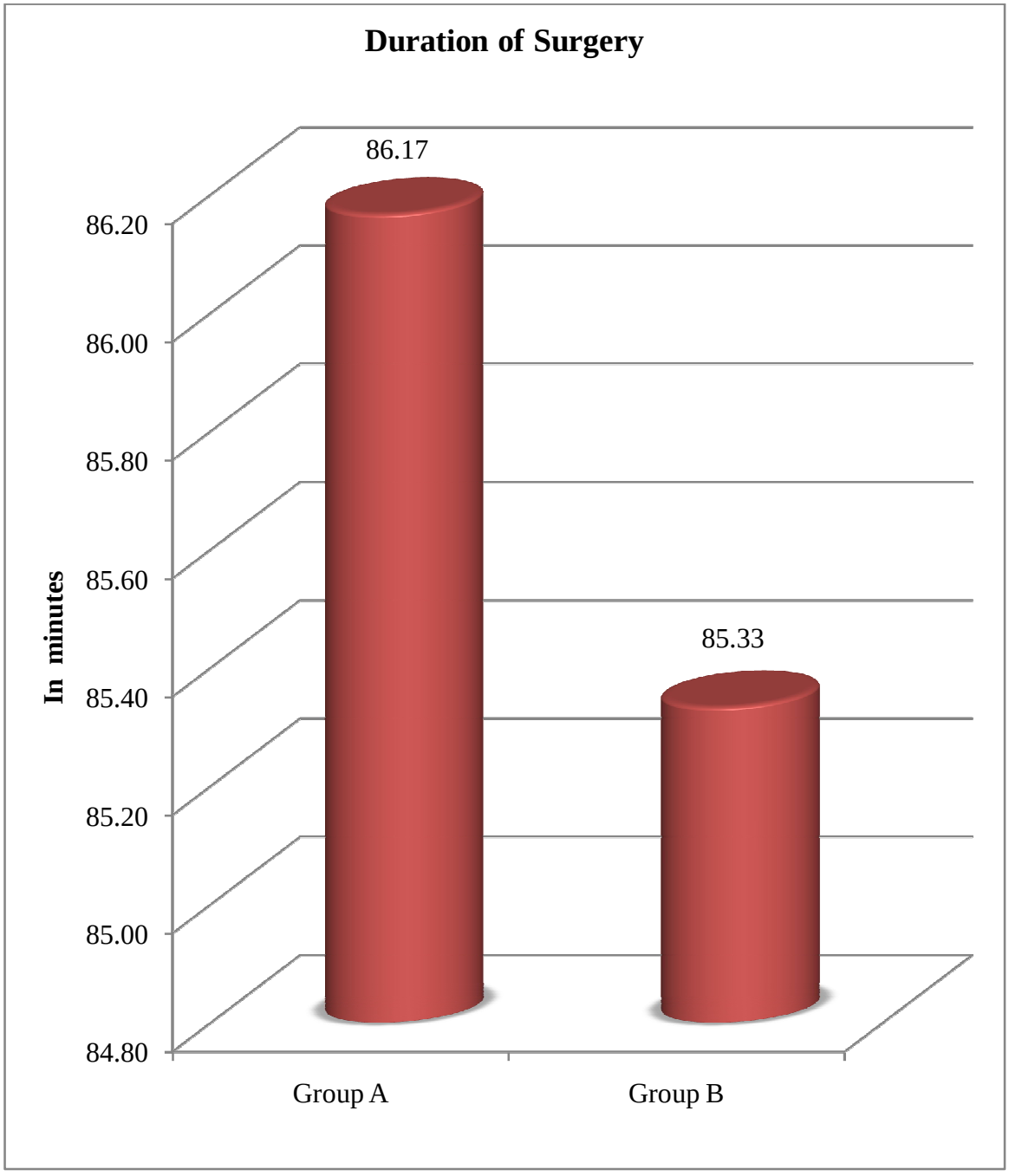

Duration of Surgery
86.17
85.33
86.20
86.00
85.80
85.60
85.40
85.20
85.00
84.80
In minutes
Group A
Group B

Table 5 : Depth of insertion

Parameter	Depth of insertion(in cms)	
	Corocoid approach group A	**Clavicular approach group B**
Range	2.8 – 3.3	3.3 – 3.8
Mean	3.007	3.577
SD	0.141	0.125
'p'	0.000 Significant	

The depth of insertion in group A ranged from 2.8 to 3.3 cms, with mean 3.007 and standard deviation 0.141 where as in group B, the range was about 3.3 to 3.8 cms, with mean 3.577 and standard deviation 0.125. The 'p'value was found to be 0.000 (p value<0.05). Hence, the difference among the two study groups was found to be statistically significant.

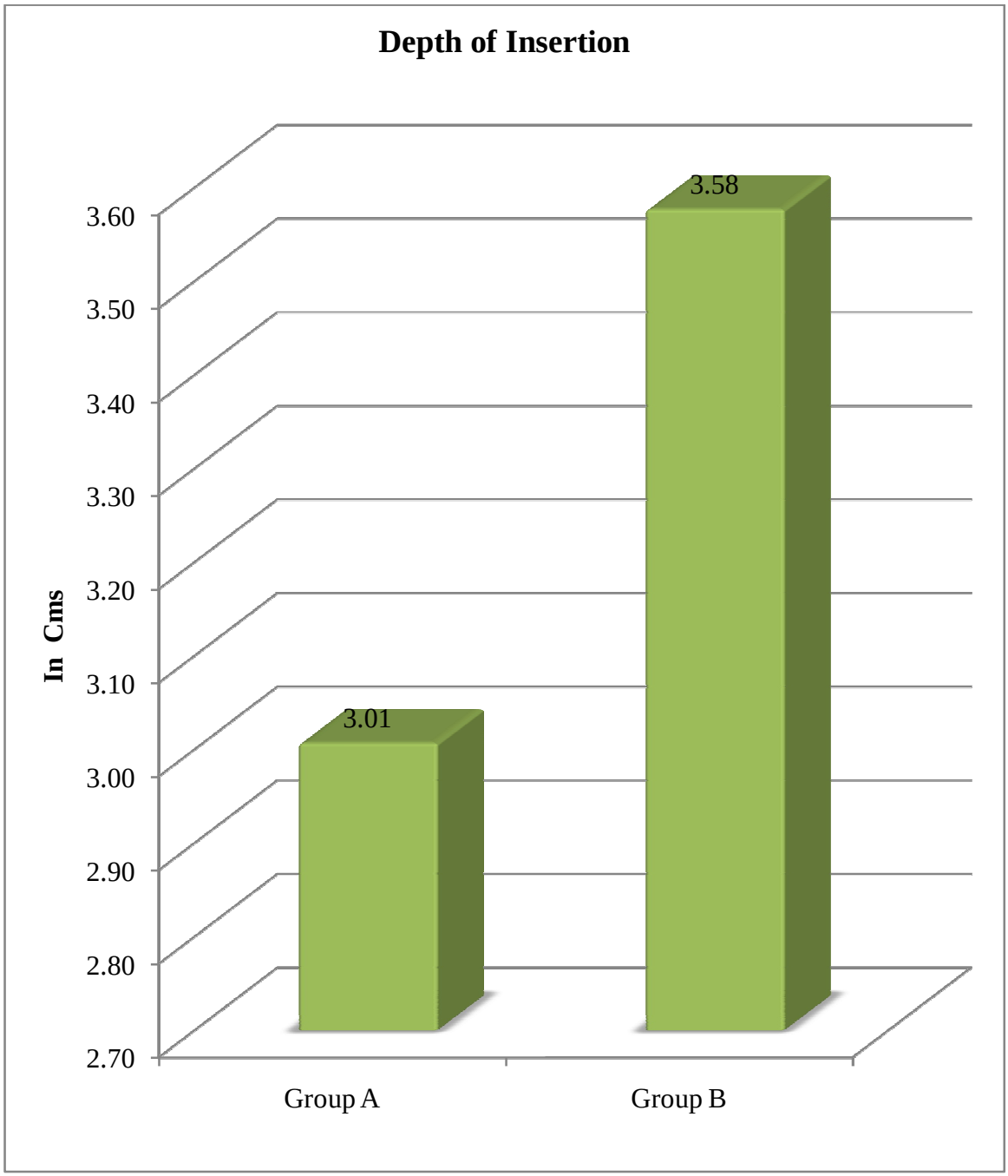

Depth of Insertion
In Cms
3.60
3.50
3.40
3.30
3.20
3.10
3.00
2.90
2.80
2.70
3.01
3.58
Group A
Group B

Table 6 : Time taken to Perform Block

Parameter	Time taken to perform block (in minutes)	
	Corocoid approach Group A	**Clavicular approach Group B**
Range	3- 8	6-11
Mean	5.13	8.53
SD	1.279	1.137
'p'	0.000 Significant	

Time taken to perform block ranges from 3 to8 minutes in group A with mean of 5.13 and standard deviation of 1.279 whereas in group B, it ranges from 6 to 11 minutes with mean 8.53 and standard deviation 1.137. The 'p'value was found to be 0.000 (p value<0.05). Hence, the difference observed among the two study groups was found to be statistically significant.

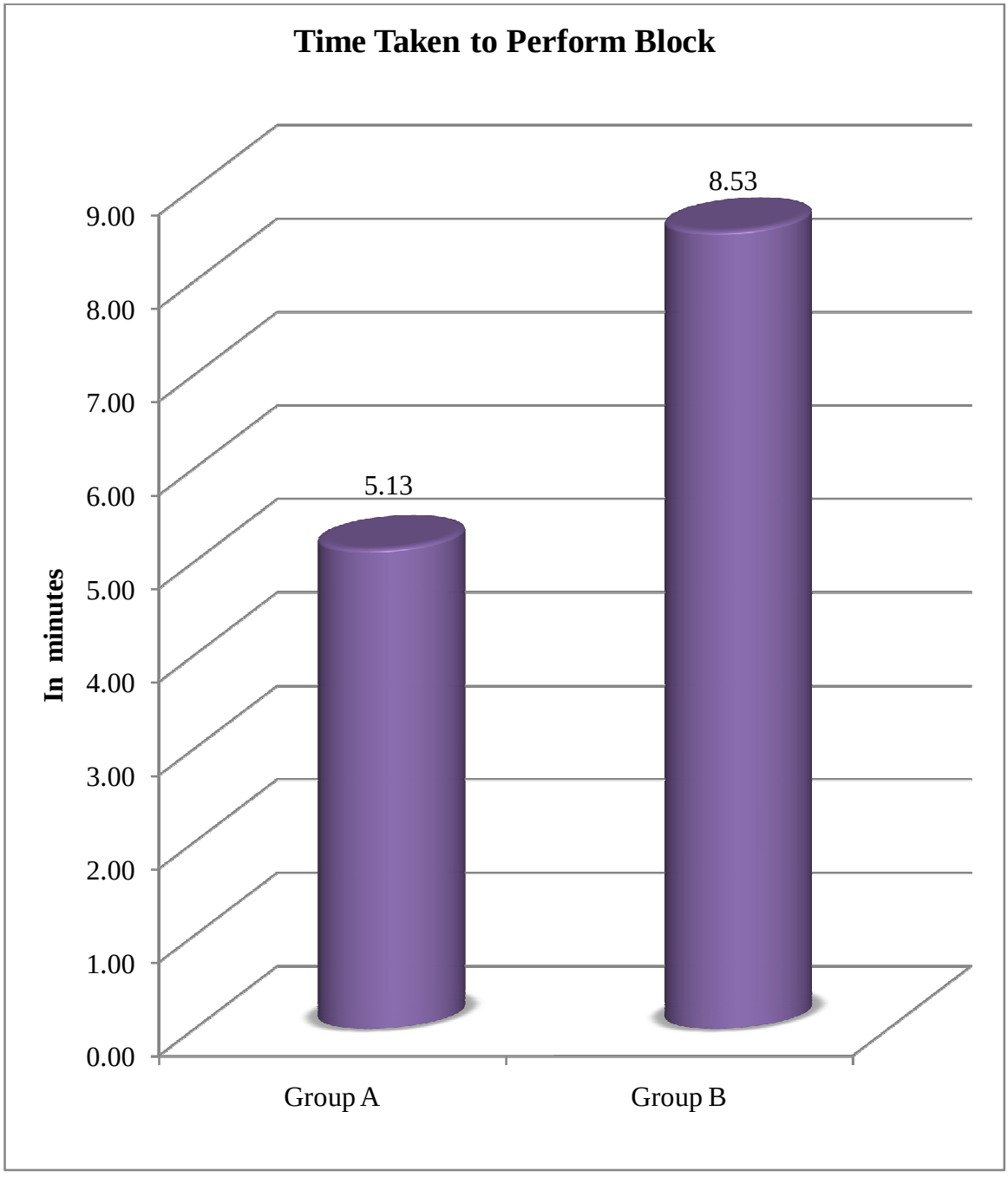

Time Taken to Perform Block
In minutes
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
5.13
8.53
Group A
Group B

Table 7: Time taken for the onset of Sensory Blockade

Parameter	Time taken for the onset of sensory blockade (in minutes)	
	Corocoid approach Group A	**Clavicular approach Group B**
Range	3- 7	3-7
Mean	4.73	4.67
SD	1.048	1.093
'p'	0.810 Not significant	

The onset of sensory blockade was found to be ranging from 3 to 7 minutes in group A, with mean 4.73 and standard deviation 1.048 whereas in group B, the range was 3 to 7 minutes with mean 4.67 and standard deviation 1.093.

The 'p'value was found to be 0.810 (p value>0.05). Hence, the difference observed among the two study groups was found to be statistically not significant.

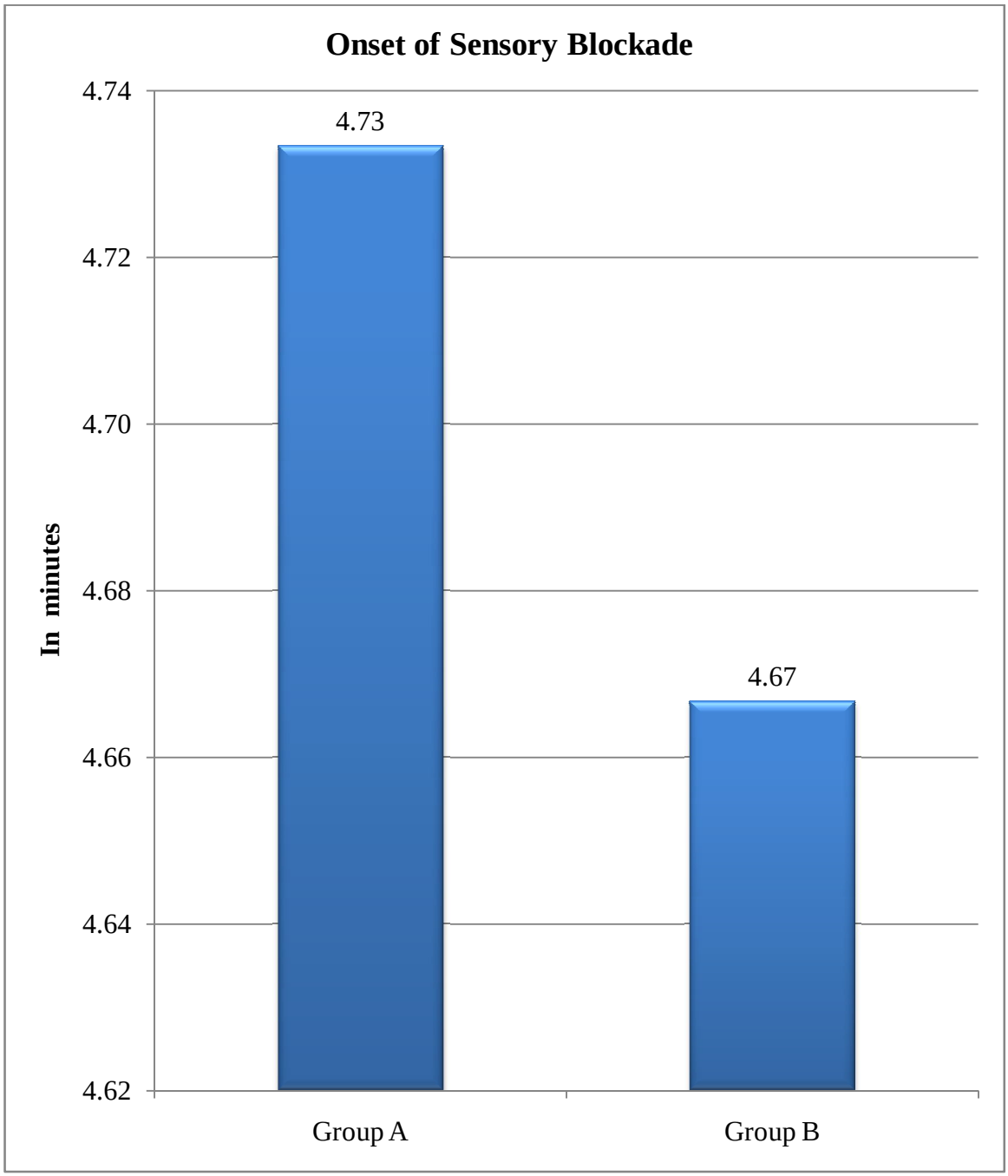

Onset of Sensory Blockade
4.74
4.72
4.70
4.68
4.66
4.64
4.62
In minutes
4.73
4.67
Group A
Group B

Table 8: Time taken for the onset of motor blockade

Parameter	Time taken for the onset of motor blockade (in minutes)	
	Corocoid approach Group A	**Clavicular approach Group B**
Range	5-10	6-11
Mean	7.83	8.20
SD	1.206	1.297
'p'	0.261 Not significant	

The onset of motor blockade was found to be ranging from 5 to 10 minutes in group A, with mean 7.83 and standard deviation 1.206 whereas in group B, the range was 6 to11 minutes with mean 8.20 and standard deviation 1.297.

The 'p'value was found to be 0.261 (p value >0.05). Hence, the difference observed among the two study groups was found to be statistically not significant.

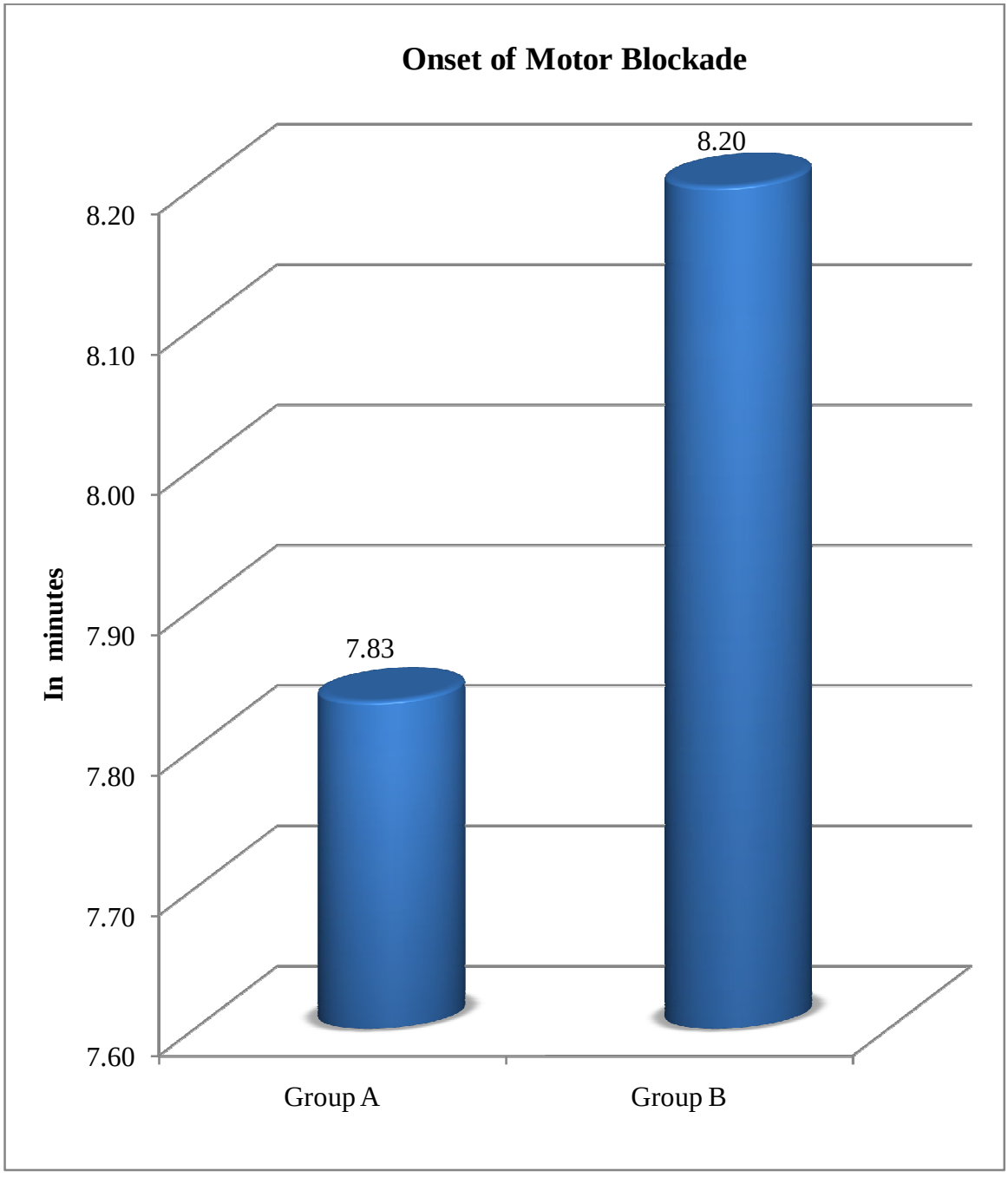

Onset of Motor Blockade
In minutes
8.20
8.10
8.00
7.90
7.80
7.70
7.60
7.83
8.20
Group A
Group B

Table 9: Discomfort during blockade

Discomfort during blockade	Corocoid approach group A		Clavicular approach group B	
	No	%	**No**	%
0- Nil	11	36.7	4	13.3
1- Mild	13	43.3	10	33.3
2- Moderate	4	13.3	11	36.7
3- Severe	2	6.7	5	16.7
'p' value	0.042 Significant			

No discomfort was observed in 11(36.7%) patients belonging to group A compared to 4(13.3%) patients in group B.

Mild discomfort was observed in 13(43.3%) patients belonging to group A compared to 10(33.3%) patients in group B.

Moderate discomfort was observed in 4(13.3%) patients belonging to group A compared to 11(36.7%) patients in group B.

Severe discomfort was observed in 2(6.7%) patients belonging to group A compared to 5(16.7%) patients in group B.

The 'p'value was observed to be 0.042 (p value <0.05). Hence, the difference observed among the two study groups was found to be statistically significant.

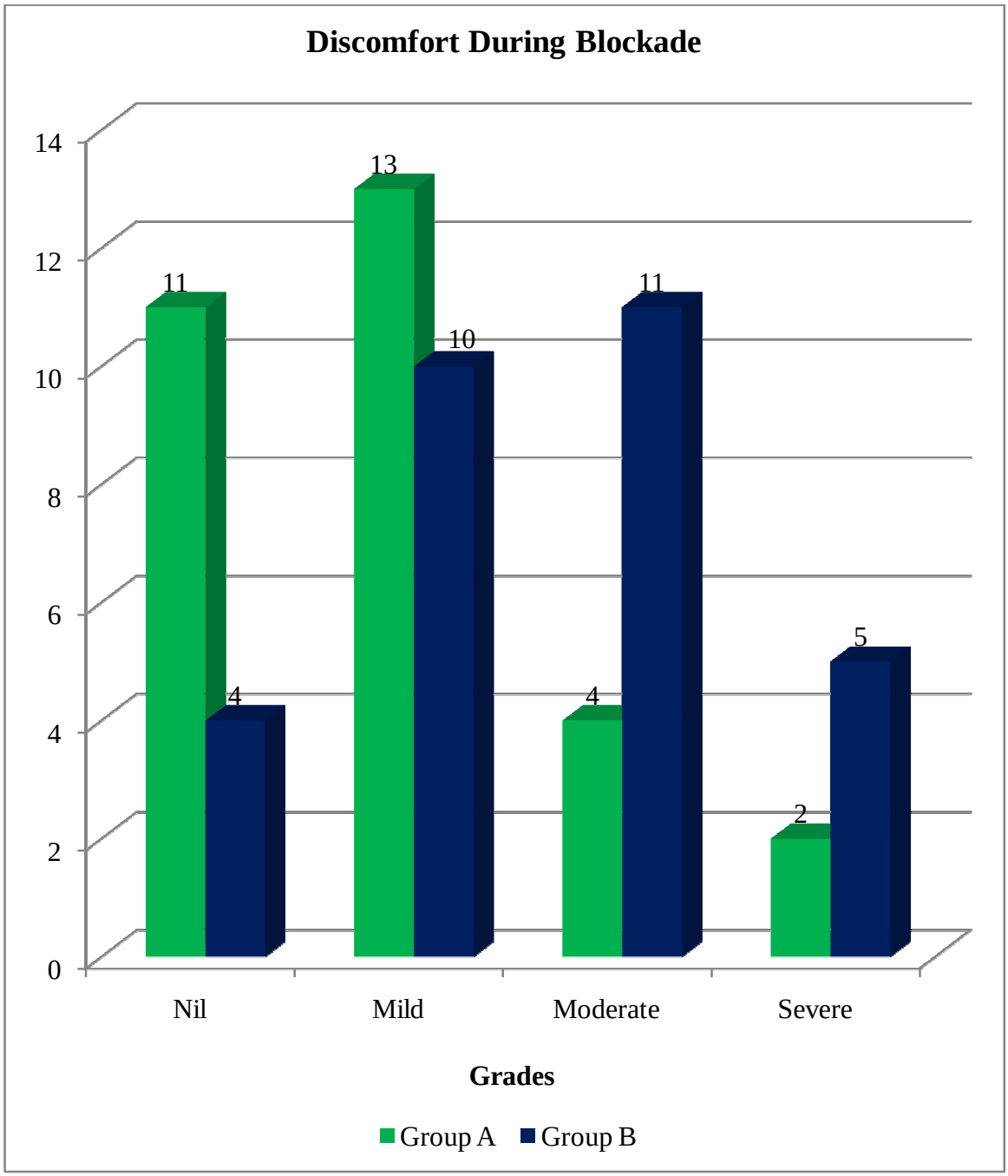

Discomfort During Blockade
14
12
10
8
6
4
2
0
11
4
13
10
4
11
2
5
Nil
Mild
Moderate
Severe
Grades
Group A
Group B

Table 10 : Success rate – sufficiency of the block to perform surgery

Success of procedure	Corocoid approach group A		clavicular approach group B	
	No	**%**	**No**	**%**
Sufficient	27	90	21	70
Insufficient	3	10	9	30
'p'	0.053 Significant			

Block was sufficient to perform surgery in 27(90%) of patients and insufficient in 3(10%)patients in group A whereas in group B, block was sufficient to perform surgery in 21(70%) patients and insufficient in 9(30%) patients.

The 'p' value was observed to be 0.053 and the difference among the two groups was to identified to be statistically significant.

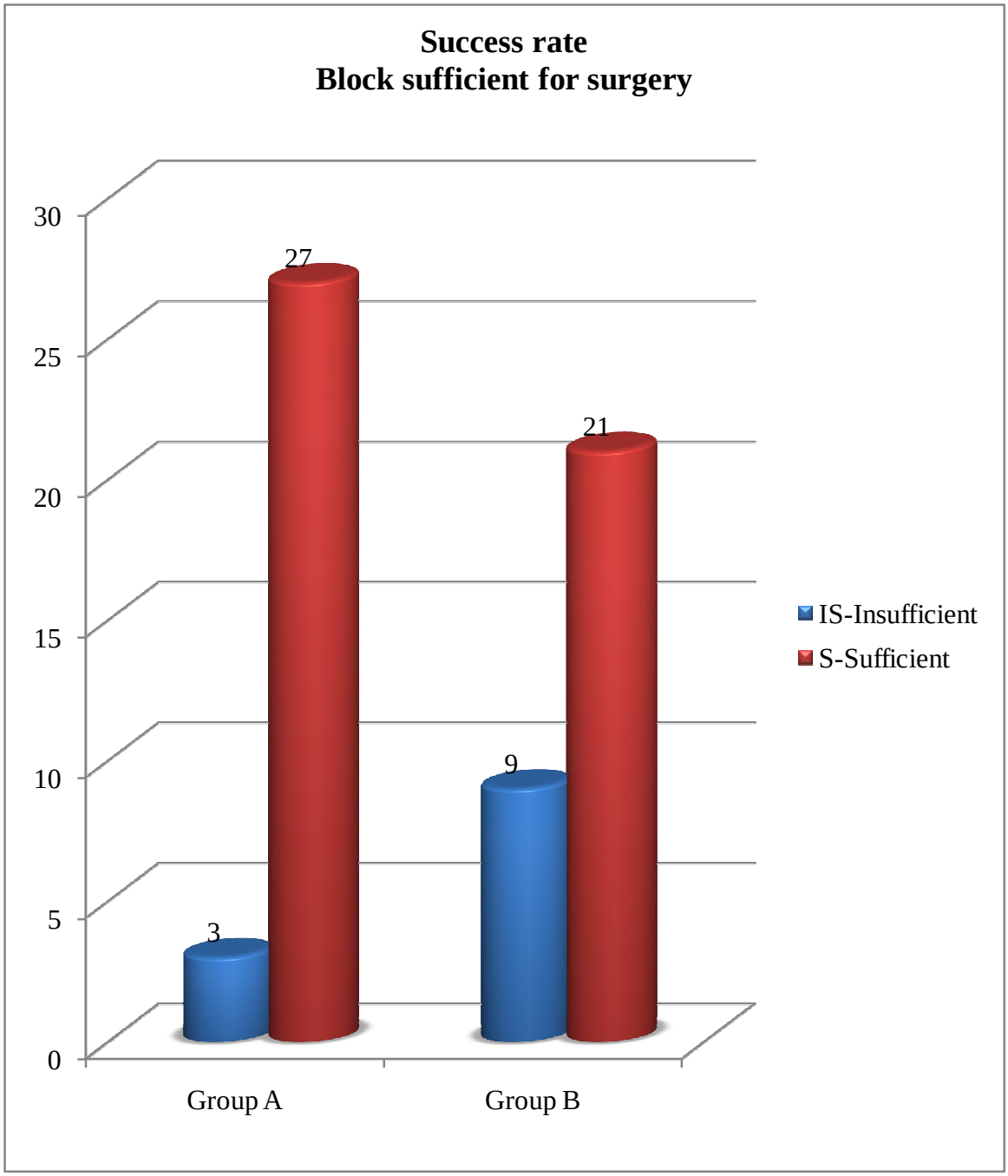

Success rate
Block sufficient for surgery
30
25
20
15
10
5
0
27
21
9
3
Group A
Group B
IS-Insufficient
S-Sufficient

Table 11: Supplementation needed

Supplementation needed	Corocoid approach Group A		Clavicular approach Group B	
	No	%	No	%
Nil	27	90	22	73.3
LA/IV	2	6.7	6	20
GA	1	3.3	2	6,7
'p' value	0.241 Not significant			

There was no need for supplementation in 27(90%) patients in group A and 22(73.3%) patients in group B. Supplementation with LA/IV fentanyl was needed in 2(6.7%) patients, compared to 6(20%) patients in group B. Conversion to general anaesthesia was needed in1(3.3%) patient , compared to 2(6.7%) patients belonging to group B.

The 'p' value was 0.241 and the difference among the two study groups was found to be statistically not significant.

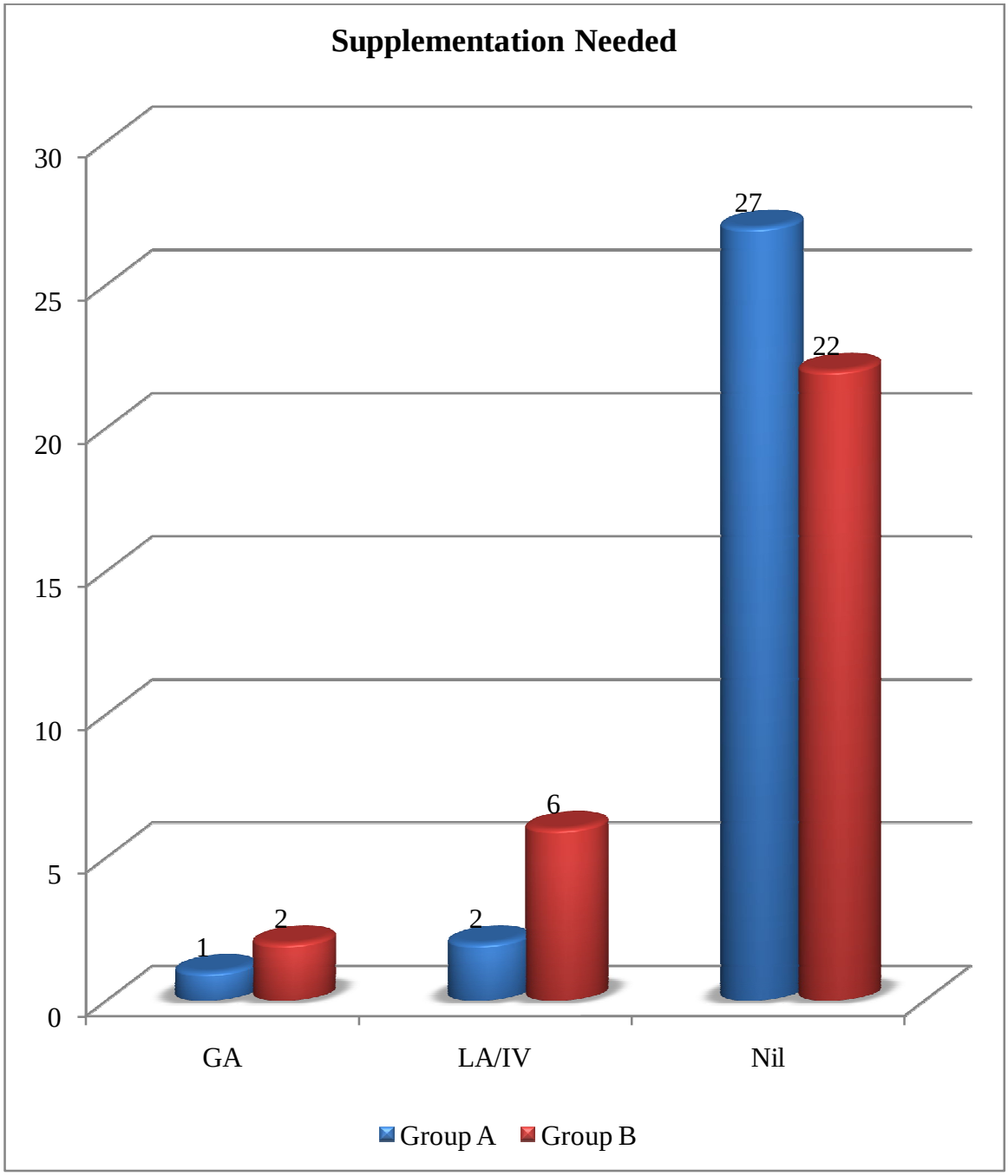

Supplementation Needed
30
25
20
15
10
5
0
27
22
6
2
2
1
GA
LA/IV
Nil
Group A
Group B

Table 12 : Tourniquet Tolerance

Tourniquet tolerance	Corocoid approach Group A		Clavicular approach Group B	
	No	%	No	%
0-no sensation	27	90	22	73
1-Sensation No pain	2	6.7	5	16.7
2-pain	1	3.3	3	10
'p' value	0.0247 Significant			

There was no tourniquet sensation in 27(90%) patients in group A compared to 22(73%) of patients in group B. Tourniquet sensation was felt but no pain in 2 (6.7%) patients in groupA compared to 5(16.7%) patients in group B. Tourniquet pain was felt in 1(3.3%)patient belonging to group A compared to 3(10%) patients belonging to group B.

The 'p' value was 0.0247 and the difference among the two study groups was observed to be statistically significant.

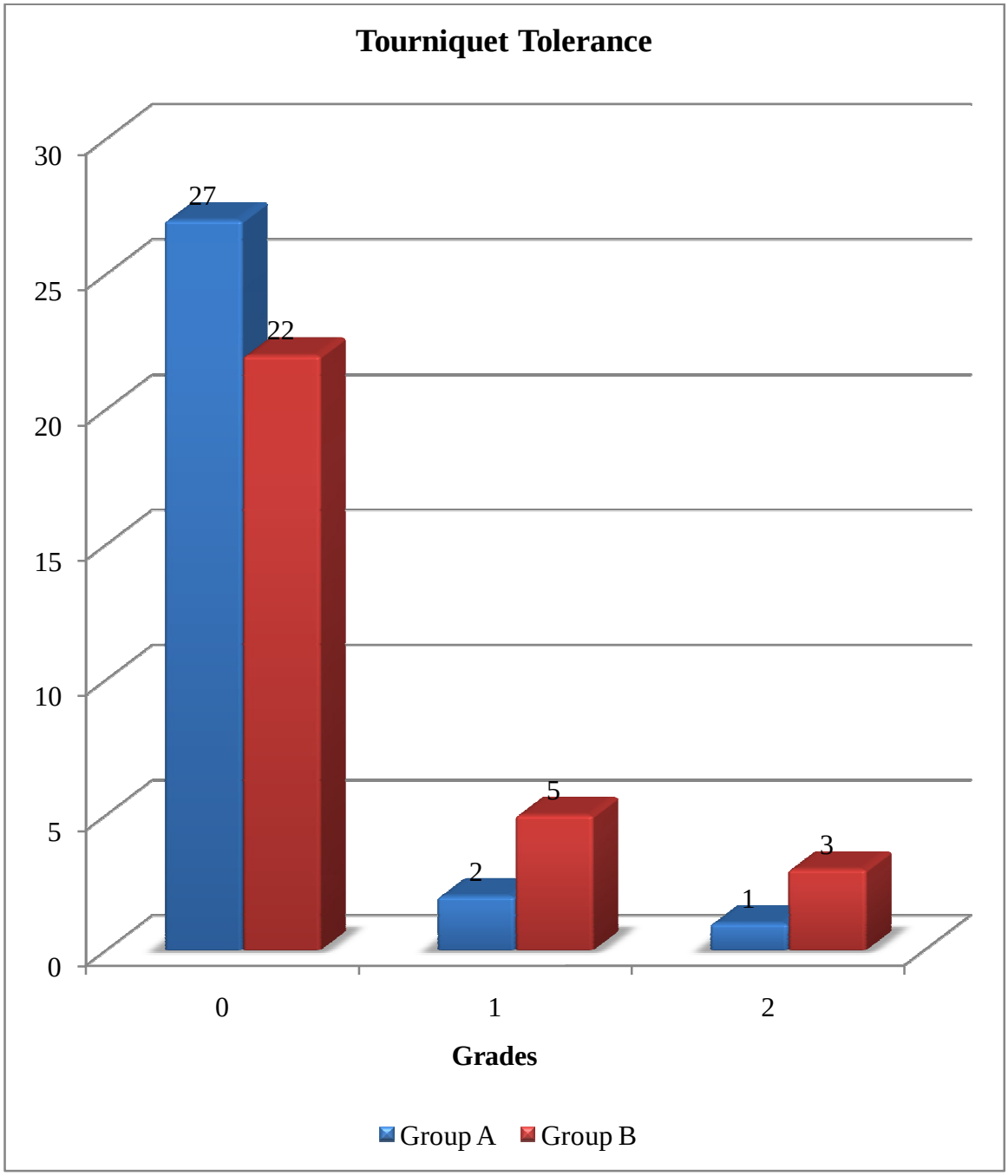

Tourniquet Tolerance
30
25
20
15
10
5
0
27
22
2
5
1
3
0
1
2
Grades
Group A
Group B

Table 12 : Degree of motor blockade

Tourniquet tolerance	Corocoid approach Group A		Clavicular approach Group B	
	No	%	No	%
Grade 1	1	3.3	4	13.3
Grade 2	2	6.7	5	16.7
Grade 3	3	10	5	16.7
Grade 4	24	80	16	53.3
'p' value	0.159 Not significant			

Degree of motor blockade was found to be grade 1 in 1(3.3%) patient in group A and in 4(13.3%) patients in group B, grade 2 in 2(6.7%) patients in group A and in 5(16.7%) patients in group B grade 3 in 3(10%) patients in group A and in 5(16.7%) patients in group B. grade 4 in 24(80%) patients in group A and in 16(53.3%) patients in group B. The 'p' value was 0.159 and the difference between the two study groups was found to be statistically not significant.

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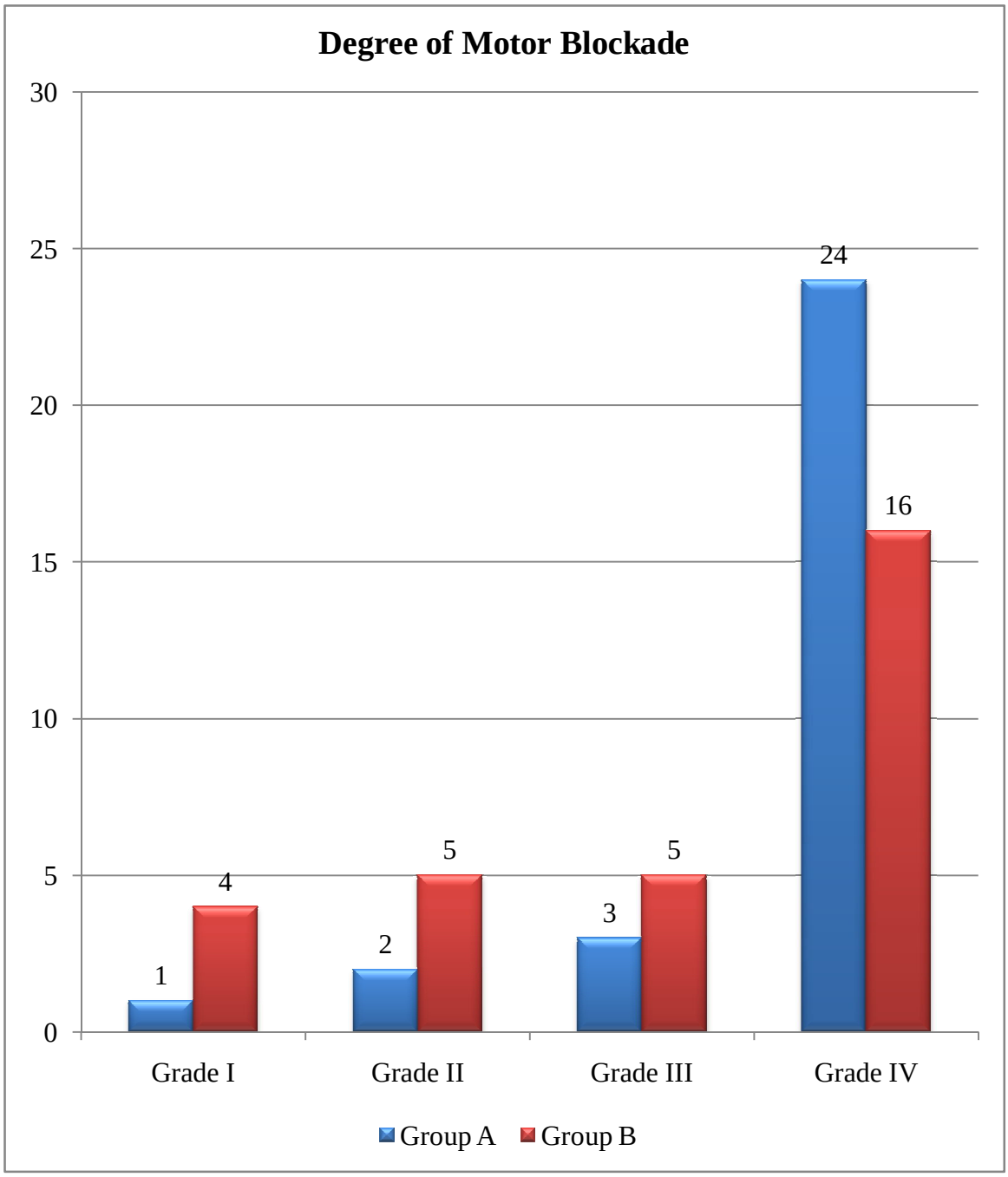
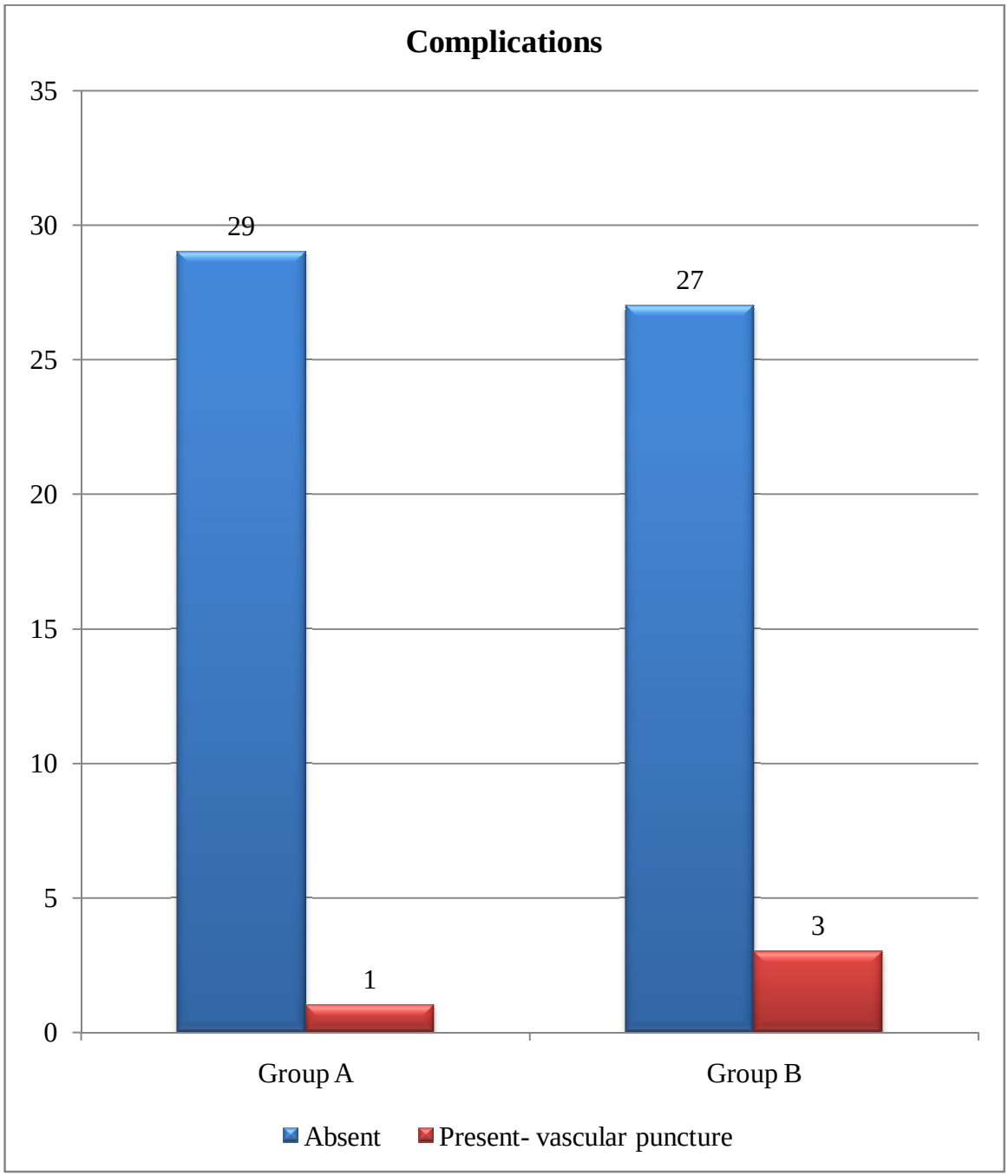

Degree of Motor Blockade
30
25
20
15
10
5
0
1
4
2
5
3
5
24
16
Grade I
Grade II
Grade III
Grade IV
Group A
Group B

Table 13 : Complications

Complications	Corocoid approach group A		Clavicular approach groupB	
	No	**%**	**No**	**%**
Present vascular puncture	1	3.3	3	10
Absent	29	96.7	27	90
'p'	0.301 Significant			

Complications like vascular puncture occurred in 1(3.3%) patient in groupA, compared to3(10%) patients in group B. complications didn't occur in 29(96%) patients in group A, compared to 27 (90%) in group B.

The 'p' value was 0.301 and the difference between the two study groups was found to be statistically not significant.


Complications
35
30
25
20
15
10
5
0
29
1
27
3
Group A
Group B
Absent
Present- vascular puncture

DISCUSSION

Brachial plexus block, like other regional anaesthetic techniques, offers specific advantage compared to general anaesthesia to the patients, surgeon, anaesthesiologist.

The use of brachial plexus block may minimize development of central nervous system hyper excitability during a surgical procedure carried out during general anesthesia.

Patients who present for surgery with an upper extremity at risk of vascular compromise may improve soon after the pain is relieved and also by the vasodilatation produced by the block.

The present study comprised of 60 patients, divided randomly into two groups with 30 patients each.

Data obtained were subjected to statistical analysis and the results were interpreted as follows:

Demographic profile:

Age distribution:

Vikas Trehan et al in their study reported that the age distribution among the study groups was about 33 ± 10.02 in corocoid group where as in clavicular group, it was 36 ± 13.08 with the ‘p’ value 0.9459 which was statistically not significant.

In the present study, age distribution among the study groups was about 31.8 ± 6.8 in group A where as in group B, it was 33.11± 7.8 with the ‘p’ value 0.826 which was statistically not significant.

Sex distribution:

In the present study, 20 patients were males (66.7%) and 10 patients were females (33.3%) in group A where as in group B, 21 patients were males (70%) and 9 patients were females(30%), with the ‘p’ value 0.781($p>0.05$). Hence, it was statistically not significant and there was no significant difference in sex distribution among the two groups.

Weight distribution:

Vika Trehan et al in their study demonstrated that weight distribution among the study groups was about 64 ± 3.97 in corocoid group where as in clavicular group, it was 62 ± 4.60 with the ‘p’ value 0.2976 which was statistically not significant.

In the present study, weight distribution among the study groups was about 61.2 ± 2.32 in group A where as in group B, it was 61± 2.43 with the ‘p’ value 0.787 which was statistically not significant.

From the data analysed it was interpreted that the distribution of demographic profile like age, sex, weight seems to be equal and comparable among the two study groups.

Duration of surgery:

Vikas Trehan et al , in their study, proposed that the duration of surgery lasted for 43±14.53 minutes in corocoid group and 40.3 ±13.3 minutes in clavicular group with ‘p’ value 0.956 which was statistically not significant.

In the present study, the duration of surgery lasted for 86±6.25 minutes in corocoid group and 85±6.14 minutes in clavicular group with ‘p’ value 0.605 which was statistically not significant. Hence, the duration of surgery was comparable in both study groups.

Depth of insertion:

Vikas Trehan et al , in their study, demonstrated that the depth of insertion was about 3.1 ±0.24 cms in corocoid group and 3.6±0.19 in clavicular group with ‘p’ value 0.001 which was statistically significant.

In the present study, the depth of insertion was about 3.0±0.14 cms in corocoid group and 3.5±0.12 in clavicular group with ‘p’ value 0.000. There was a statistically significant difference in the depth of insertion between the two study groups.

Hence, the depth of insertion was observed to be significantly less in corocoid approach than in clavicular approach.

Time taken to perform block:

The time taken to perform the block was found to be 5.1± 1.3 minutes in group A whereas in group B, it was about 8.5± 1.1 minutes with ‘p’ value 0.000 ($p<0.05$) which was found to be statistically significant.

The time taken to perform infraclavicular block using corocoid approach seemed shorter than clavicular approach.

Onset of Sensory Blockade:

In the present study, onset of sensory blockade was found to be 4.7±1.05 minutes in group A where as in group B, it was about 4.67±1.09 minutes with ‘p’ value 0.810 which was found to be statistically not significant.

Hence, the onset of sensory blockade was similar and comparable in both the study groups.

Onset of Motor Blockade:

In the present study, onset of motor blockade was found to be 7.8±1.2 minutes in group A where as in group B, it was about 8.2±1.3 minutes with ‘p’ value 0.261 which was found to be statistically not significant.

Hence, the onset of motor blockade was similar and comparable in both the study groups.

Discomfort during blockade:

Discomfort during blockade mainly occurs during positioning of the limb.

Vikas Trehan et al in their study reported that most patients in group A had nil discomfort or had only mild discomfort while performing the block (22 vs. 16) whereas more patients had moderate to severe discomfort while performing block in clavicular approach, comparing the other (14 vs. 8).But the difference was not significant ($P = 0.337$)

In the present study also, most of the patients in group A had nil discomfort or had only mild discomfort while performing the block (24 vs. 14) whereas more patients had moderate to severe discomfort while performing block in clavicular approach, comparing the other (16 vs. 6).

The ‘p’value was found to be 0.042 ($p<0.05$) and the difference between the two study groups was found to be statistically significant.

Hence, coracoid approach seems to be better since positioning of the limb to be operated was relatively painless and also easy to approach.

Success rate:

In the study done by Vikas Trehan et al, Success rate was defined as carrying out the surgery without any need for supplementation was 87% in the coracoid approach (group A) and 73% in clavicular approach (group B), but there was no statistically significant difference (P >0.05).

Borgeat *et al.* (2001) demonstrated a clinical success rate of 44% when a proximal response was taken for local anesthetic injection, compared to 97% when a distal response was taken.

In the present study, block was sufficient for surgery in about 90% in corocoid approach (group A) and 70% in clavicular approach(group B) and the difference was found to be statistically significant(p=0.05)

Hence, the successful block was achieved more with corocoid approach group than with the clavicular approach group.

Supplementation needed:

Vikas Trehan et al in their study demonstrated that 2 patients in group A and 5 patientsin group B needed infiltration of the surgical site by the surgeon and 2 patients in group A and 3 patientsin group B needed GA .

In the present study, supplementation with LA/IV fentanyl needed in 2 (6.7%) and 6(20%) patients in groups A and B respectively.

Conversion to GA was needed in 1 (3%) and 2(6.7%) patients in groups A and B respectively. The ‘p’ value was 0.241 and there was no statistically significant difference between the two groups.

Hence, the requirement for supplementation was comparable among the study groups.

Tourniquet Tolerance:

Vikas Trehan et al in their study of 30 patients each in two groups proposed that tolerance to tourniquet was better in most patients without any need for infiltration. No tourniquet sensation was present in 17 and 14 patients in corocoid approach and clavicular approach groups respectively.

In the present study, there was no tourniquet sensation in 27(90%) patients in group A compared to 22(73%) of patients in group B. Tourniquet sensation was felt but no pain in 2 (6.7%) patients in groupA compared to 5(16.7%) patients in group B. Tourniquet pain was felt in 1(3.3%)patient in group A compared to 3(10%) patients in group B.

The ‘p’ value was 0.0247 and the difference between the two study groups was found to be statistically significant.

Hence, tourniquet tolerance has been found to be better with coracoid approach than with clavicular approach group.

Degree of motor blockade:

Vikas Trehan et al in their study, reported that the degree of motor blockade was equal in both groups with (P = 0.26) 22 (73.33%) grade 1 in 1(3.3%) patient in group A and in 4(13.3%) patients in group B, grade 2 in 2(6.7%) patients in group A and in 5(16.7%) patients in group B grade 3 in 3(10%) patients in group A and in 5(16.7%) patients in group B. grade 4 in 24(80%) patients in group A and in 16(53.3%) patients in group B.

The ‘p’ value was 0.159 and the difference between the two study groups was found to be statistically not significant.

Complications:

Vikas et al in their study, proposed that the incidence of complications related to block was very low in both approaches. They reported one case of venous puncture in either groups.

In the present study, complications like vascular puncture occurred in 1(3.3%) patient in group A, compared to 3(10%) patients in group B. There was no incidence of pneumothorax or vascular puncture in both the groups . The ‘p’ value was 0.301 and the difference between the two study groups was found to be statistically not significant.

In general, incidence of complications seemed to below in both the study groups.

SUMMARY

60 patients who undergo upper limb surgeries coming under ASA PS I and II in the age group of 18- 45 years were divided randomly into two groups, Group A and Group B.

In 30 patients belonging to group A, infraclavicular block of brachial plexus block was performed using corocoid approach, and in 30 patients belonging to group B, infraclavicular block of brachial plexus block was performed using clavicular approach.

Parameters like duration of surgery, depth of insertion, block performance time, onset of sensory and motor blockade, success rate, supplementation needed, tourniquet tolerance and its quality, degree of motor blockade and block related complications like pneumothorax, vessel puncture were observed.

It was interpreted that

1. The depth of insertion was less with corocoid approach group when compared to clavicular approach group.
2. Time taken to perform block was shorter in corocoid approach group when compared to clavicular approach group.
3. Onset of both sensory and motor blockade were similar in both the groups.

4. Successful block was achieved more with corocoid approach group than with the clavicular approach group.
5. Tourniquet tolerance was found to be better with corocoid approach group than with the clavicular approach group.
6. Complication like vascular puncture was similar in both the study groups.

Thus, infraclavicular block of brachial plexus using corocoid approach was found to be better than clavicular approach in various aspects.

CONCLUSION

Infraclavicular brachial plexus block using corocoid approach provides an adequate sensory and motor blockade, easy to perform with high success rate, good tourniquet tolerance and less complications when compared to that using clavicular approach.

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INSTITUTIONAL ETHICAL COMMITTEE
GOVT.KILPAUK MEDICAL COLLEGE,
CHENNAI-10
Protocol ID No. 04/03/15Dt. 26/03/.2015
CERTIFICATE OF APPROVAL

The Institutional Ethical Committee of Govt. Kilpauk Medical College, Chennai reviewed and discussed the application for approval "Randomised controlled study of comparison of two Approaches of infraclavicular brachial plexus block using nerve stimulator for upper limb surgeries"- For Project Work- submitted by Dr.R.Geethanjali, MD (Anaesthesiology), Post Graduate Student, Govt Kilpauk Medical College, Chennai-10.

The Proposal is APPROVED.

The Institutional Ethical Committee expects to be informed about the progress of the study any Adverse Drug Reaction Occurring in the Course of the study any change in the protocol and patient information /informed consent and asks to be provided a copy of the final report.

CHAIRMAN,
Ethical Committee
Govt.Kilpauk Medical College,Chennai

GOVT. KILPAUK MEDICAL COLLEGE * Kilpauk, Chennai-10. * SEP

25/03/2015

6 Comp:> ME 1> Ethical Committee

PROFORMA

Name:

Age:

Sex: Weight:

IP. No: Ward/ SU

Group A/ Group B

Date of admission: Date of surgery:

ASA Physical Status:

Co- Morbidity:

Patient on any drugs:

Preoperative examination:

Blood pressure:

Pulse rate :

Respiratory rate:

Temperature:

Room air SpO2:

Cardiovascular system:

Respiratory system:

Abdomen:

Central nervous system:

Investigations:

Diagnosis:

Surgery being performed

IV access:

Monitors:

Premedication:

Procedure :

Intraoperative haemodynamics monitored.

Parameters :

1. Duration of surgery: mins
2. Depth of insertion: cms
3. Time taken to perform block: mins
4. Time taken for the onset of sensory blockade: mins
5. Time taken for the onset of motor blockade: mins
6. Discomfort during blockade:

Grade 0	Nil	
Grade 1	Mild	
Grade 2	Moderate	
Grade 3	Severe	

7. Success rate – sufficiency of the block to perform surgery:

   Sufficient/ Insufficient

8. Supplementation needed:

Nil	
Local anaesthetic infiltration	
IV Fentanyl	
Conversion to GA	

9. Tourniquet Tolerance:

Grade 0	No sensation	
Grade 1	Sensation only, no pain	
Grade 2	No pain	

10. Degree of motor blockade:

Grade 1	Flex and extend forearm	
Grade 2	Flex and extend only wrist and fingers	
Grade 3	Flex and extend only fingers	
Grade 4	No movement of forearm, wrist or fingers	

11. Complications:

    Present/ Absent

    If present, type of complication:

நோயாளி ஒப்புதல் படிவம்

ஆராய்ச்சியின் விவரம் :

ஆராய்ச்சி மையம் : அரசு கீழ்பாக்கம் மருத்துவக் கல்லூரி மருத்துவமனை

நோயாளியின் பெயர் : நோயாளியின் வயது:

பதிவு எண் :

நோயாளி கீழ்கண்டவற்றுள் கட்டங்களை (✓) செய்யவும்

1 மேற்குறிப்பிட்டுள்ள ஆராய்ச்சியின் நோக்கத்தையும் பயனையும் முழுவதுமாக புரிந்து கொண்டேன். மேலும் எனது அனைத்து சந்தேங்களையும் கேட்டு அதற்கான விளக்கங்களையும் தெளிவுபடுத்திக் கொண்டேன். ☐

2 மேலும் இந்த ஆராய்ச்சிக்கு எனது சொந்த விருப்பத்தின் பேரில் பங்கேற்கிநேன் என்றும், மேலும் எந்த நேரத்திலும் எவ்வித முன்றிவிப்பு மின்றி இந்த ஆராய்ச்சியிலிருந்து விலக முழுமையான உரிமை உள்ளதையும் இதற்கு எவ்வித சட்ட பிணைப்பும் இல்லை என்பதையும் அறிவேன். ☐

3 ஆராய்சியாளரோ, ஆராய்ச்சி உதவியாளரோ, ஆராய்ச்சி உபயத்தாரரோ, ஆராய்ச்சி பேராசிரியரோ, ஒழுங்குநெறி செயற்குழு உறுப்பினர்களோ எப்போது வேண்டுமானாலும் எனது அனுமதியின்றி எனது உள்நோயாளி மற்றும் புற நோயாளி பதிவுகளை இந்த ஆராய்ச்சிக்காகவோ அல்லது எதிர்கால பிறஆராய்ச்சிகளுக்காகவோ பயன்படுத்திக் கொள்ளலாம் என்றும் மேலும் இந்த நிபந்தனை நான் இவ்வராய்ச்சிலிருந்து தகும் என்றும் ஒப்புக்கொள்கிறேன். ஆயினும் எனது அடையாளம் சம்பந்தப்பட்ட எந்த பதிவகளும் (சட்டபூர்வமான தேவைகள் தவிர) வெளியிடப்படமாட்டது என்ற உறுதிமொழியின் பெயரில் இந்த ஆராய்ச்சிலிருந்து கிடைக்கப்பெறும் முடிவுகளை வெளியிட மறுப்பு தெறிவிக்கமாட்டேன் என்று உறுதியளிக்கிறேன். ☐

4. இந்த ஆராய்ச்சிஆச்ன வாயின் அருகில் வரும் சீழ் கட்டியை குறித்தது. அந்த நோயின் தன்மையையும், பின் விளைவுகளையும் பற்றியும், அறுவை சிகிச்சையின் போது கீறி எடுக்கப்படும் சீழை பரிசோதனைக்கு அனுப்பி கிருமியின் தன்மையையும் அதற்கு உகந்த மருந்தை பற்றியும் அறிய நடத்தும் ஆராய்ச்சி என்பதை மருத்துவர் மூலம் அறிந்து கொண்டேன். ☐
5. இந்த ஆராய்ச்சிக்கு நான் முழுமனதுடன் சம்மதிக்கின்றேன் என்றும் மேலும் ஆராய்ச்சி குழுவினர் எனக்கு அளிக்கும் அறிவுரைகளை தவறாது பின்பற்றுவேன் என்றும் உறுதியளிக்கிறேன். ☐
6. இந்த ஆராய்ச்சிக்குத் தேவைப்படும் அனைத்து மருத்துவப்பரிசோதனைகளுக்கும் ஒத்துழைப்பு தருவேன் என்று உறுதியளிக்கிறேன். ☐
7. இந்த ஆராய்ச்சிக்கு யாருடைய எற்புறுத்தலுமின்றி எனது சொந்த விருப்பத்தின் பேரிலும் சுயஅறிவுடனும் முழுமனதுடனும் சம்மதிக்கின்றேன் என்று இதன் மூலம் ஒப்புக்கொள்கிறேன். ☐

நோயாளியின் கையொப்பம் / பெருவிரல் கைரேகை
இடம்: தேதி:

ஆராய்ச்சியாளரின் கையொப்பம்:
இடம்: தேதி:

GROUP A: Corocoid approach

S. No	I.P.No	Age (yrs)	sex	Wt (kg)	Duration of surgery (mins)	Depth of insertion (cms)	Time taken to perform block (mins)	Onset of sensory blockade (mins)	Onset of motor blockade (mins)	Discomfort during blockade	Success rate	Supple-mentation needed	Tourniquet tolerance	Degree of motor blockade	Comp-lications
1	20697	32	M	64	85	2.9	5	3	8	3	S	-	0	4	A
2	21021	34	M	60	90	3.0	4	7	9	1	S	-	0	4	A
3	20845	22	F	59	80	2.8	6	6	10	0	IS	LA/ IV	1	2	A
4	21543	31	M	61	80	3.1	5	5	8	1	S	-	0	4	A
5	21065	43	F	63	90	3.1	5	5	7	1	S	-	0	3	A
6	21517	33	M	62	75	3.0	5	6	8	2	S	-	0	4	A
7	21504	19	F	58	85	2.8	7	4	7	0	S	-	0	4	A
8	21270	34	M	64	90	3.2	8	4	6	0	S	-	0	4	A
9	21568	33	M	60	95	3.1	3	6	10	2	S	-	0	4	A
10	21332	24	F	61	85	3.0	5	4	8	1	S	-	0	4	A
11	21319	20	M	58	95	2.8	6	5	8	0	S	-	0	4	A
12	21262	26	M	63	75	3.3	4	5	9	0	S	-	0	4	A
13	21025	42	M	60	90	3.0	5	6	7	0	S	-	0	4	A
14	21707	36	F	62	90	3.1	3	5	7	1	S	-	0	3	A
15	21115	32	M	65	85	3.0	6	4	7	1	S	-	0	4	A

GROUP A: Corocoid approach

S. No	I.P.No	Age (yrs)	sex	Wt (kg)	Duration of surgery (mins)	Depth of insertion (cms)	Time taken to perform block (mins)	Onset of sensory blockade (mins)	Onset of motor blockade (mins)	Discomfort during blockade	Success rate	Supple-mentation needed	Tourniquet tolerance	Degree of motor blockade	Comp-lications
16	21057	32	F	58	75	2.9	4	5	8	0	S	-	0	4	A
17	20446	44	M	60	85	3.3	4	4	9	2	S	-	0	4	A
18	21393	23	M	65	90	3.2	5	3	7	1	IS	GA	2	1	P- vasc
19	21553	33	M	61	90	3.1	5	6	6	1	S	-	0	4	A
20	21579	35	M	63	95	3.0	5	5	5	1	S	-	0	4	A
21	21394	27	F	57	85	2.9	7	3	8	0	S	-	0	3	A
22	21558	31	M	62	80	3.0	6	4	8	0	S	-	0	4	A
23	21525	41	F	59	90	2.8	5	4	9	3	S	-	0	4	A
24	21400	35	M	60	90	3.1	8	5	8	1	S	-	0	4	A
25	21304	34	M	64	90	3.0	5	5	7	2	IS	LA/IV	1	2	A
26	21652	26	F	62	95	3.1	3	6	7	0	S	-	0	4	A
27	21534	31	F	60	75	2.9	4	5	7	1	S	-	0	4	A
28	21656	35	M	61	80	3.0	5	4	8	0	S	-	0	4	A
29	21399	24	M	58	85	2.8	6	3	9	1	S	-	0	4	A
30	20998	42	M	65	90	2.9	5	5	10	1	S	-	0	4	A

GROUP B : Clavicular approach

S. No	I.P.No	Age (yrs)	sex	Wt (kg)	Duration of surgery (mins)	Depth of insertion (cms)	Time taken to perform block (mins)	Onset of sensory blockade (mins)	Onset of motor blockade (mins)	Discomfort during blockade	Success rate	Supple-mentation needed	Tourniquet tolerance	Degree of motor blockade	Comp-lications
1	22107	20	F	59	75	3.3	9	4	9	2	S	-	0	4	A
2	21726	35	F	57	90	3.6	8	5	8	2	S	-	0	4	A
3	21865	44	M	63	85	3.8	10	5	7	1	IS	LA/IV	1	1	A
4	21209	25	M	65	80	3.5	7	4	8	3	S	-	0	3	A
5	21345	36	M	60	90	3.6	8	6	7	1	S	-	0	4	A
6	21490	42	M	60	90	3.6	9	3	6	1	S	-	0	4	A
7	21338	31	F	62	90	3.6	9	7	11	3	IS	LA/IV	2	2	P-vasc
8	21376	31	M	63	75	3.3	10	4	10	3	IS	-	1	2	A
9	21953	19	F	58	85	3.7	7	5	10	2	S	-	0	4	A
10	21385	36	M	63	85	3.4	8	5	9	1	S	-	0	3	A
11	22100	21	M	57	95	3.5	7	4	8	2	S	-	0	4	A
12	21993	37	M	65	90	3.7	9	5	7	0	S	-	0	4	A
13	21357	34	M	60	95	3.6	9	6	8	2	S	-	0	3	A
14	21376	43	M	61	75	3.4	9	4	8	2	IS	LA/IV	1	2	A
15	21428	35	F	63	80	3.5	8	5	9	0	S	-	0	4	A

GROUP B : Clavicular approach

S. No	I.P.No	Age (yrs)	sex	Wt (kg)	Duration of surgery (mins)	Depth of insertion (cms)	Time taken to perform block (mins)	Onset of sensory blockade (mins)	Onset of motor blockade (mins)	Discomfort during blockade	Success rate	Supple-mentation needed	Tourniquet tolerance	Degree of motor blockade	Comp-lications
16	21584	33	F	63	80	3.6	8	5	10	2	IS	LA/IV	1	2	A
17	21573	41	M	57	90	3.7	7	4	9	1	S	-	0	4	A
18	21560	22	M	65	95	3.8	9	3	8	1	S	-	0	4	A
19	21784	35	F	58	80	3.5	10	4	7	3	IS	GA	2	1	P-vasc
20	21875	32	M	60	75	3.6	9	6	8	2	IS	LA/IV	0	2	A
21	22106	25	F	61	90	3.7	8	5	8	0	S	-	0	4	A
22	21629	45	M	62	85	3.6	7	3	9	1	S	-	0	3	A
23	21693	27	M	60	85	3.5	10	7	7	2	S	-	0	4	A
24	21764	19	F	57	85	3.7	6	5	7	3	IS	GA	2	1	P-vasc
25	21753	31	M	63	90	3.6	11	4	8	1	S	-	0	4	A
26	21808	43	M	60	90	3.5	8	4	10	0	S	-	0	4	A
27	21746	37	M	62	80	3.6	9	6	6	2	S	-	0	3	A
28	21445	42	M	62	90	3.6	9	5	10	2	S	-	0	4	A
29	21872	36	M	63	85	3.5	9	4	7	1	S	-	0	4	A
30	21890	35	M	61	80	3.7	9	3	7	1	IS	LA/IV	1	1	A

ANNEXURE TO MASTER CHART

DISCOMFORT DURING BLOCK:

0- Nil

1- Mild

2- Moderate

3- Severe

SUCCESS RATE:

S – Sufficient for surgery

IS – Insufficient for surgery, needs supplementation.

SUPPLEMENTATION NEEDED:

LA/ IV – local anaesthetic infiltration of surgical site or intravenous fentanyl.

GA – conversion to general anaesthesia.

TOURNIQUET TOLERANCE:

0 - No sensation

1- Sensation, no pain

2- Pain

DEGREE OF MOTOR BLOCKADE:

Grade 1 : able to do flexion and extension of the forearm.

Grade 2 : able to do flexion / extension of wrist and fingers only

Grade 3 : able to do flexion / extension of fingers only,

Grade 4 : unable to move forearm, wrist or fingers.

COMPLICATIONS:

P- vasc : Present. Vascular puncture.

A- Absent